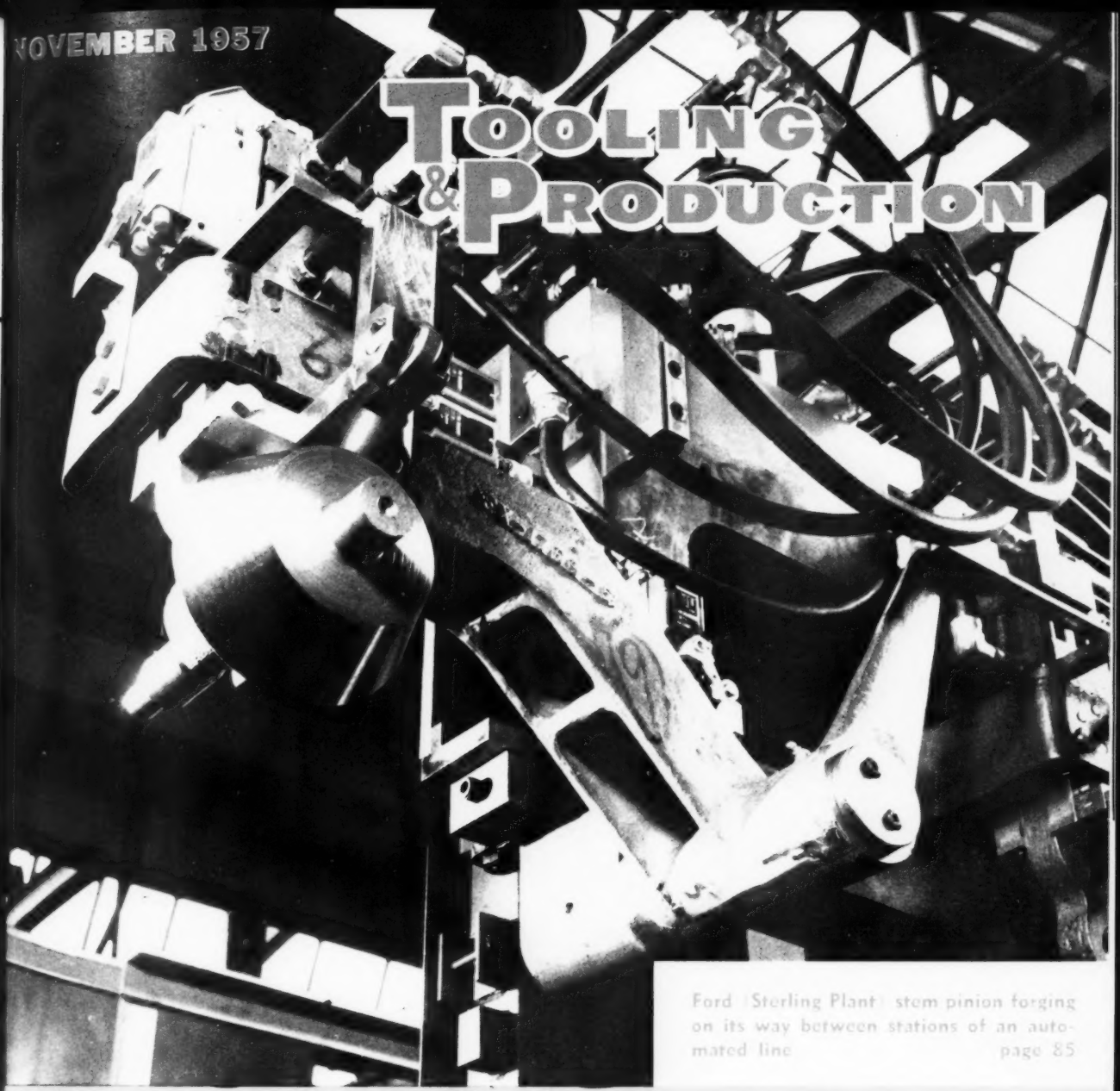
NOVEMBER 1957

TOOLING & PRODUCTION



Ford (Sterling Plant) stem pinion forging on its way between stations of an automated line page 85

Technology and People...James T. O'Connell 12

TADMU Makes Plating Machines Faster.... 59

Editorial—A Matter of Good Will.....E. Willard Pennington 67

Making Metal Behave.....Carl F. Benner 69

Precision Welding Large Work Cuts Costs.. 74

Universal Drill Jig Simplifies Operations.... 75

Ironing Improves Product & Saves Metal, Time and Money.....Carter C. Higgins 77

Armored Plastic Press Tools 82

Standard Machines Automated for High Production of Stem Pinions 85

Heavy Duty Cut-Off Saws 92

Automatic Sequence Machining & Assembly .....Kendall, Host & Kendall 93

Grinding of Multiple-Function Tools..... 99

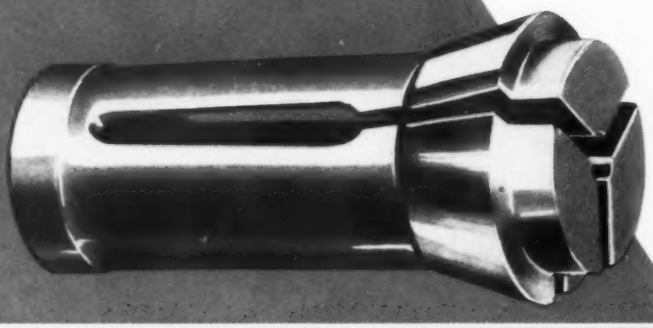
DEPARTMENTS

Manufacturing Memos 44
Coming Events 56
Shop Aids 118
Commendable Comments 138
Book Reviews 144
Helpful Literature 148
Products on Parade 168
Cumulative Editorial Index 218

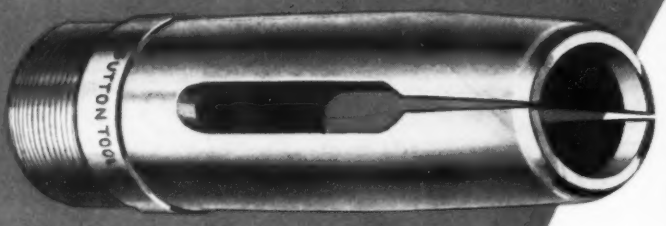
Get a better

and longer **GRIP** on production

with **SUTTON**



Collets and Feeders



Featuring uniform temper and tension

One of the reasons customers prefer Sutton Collets is the added useful life —a result of uniformity of temper and tension. Sutton's modern and *exclusive* method of heat-treating localizes controlled heat to give uniform spring temper on all collets and uniform tension on all feeders.

RUNS AS TRUE AS THE SPINDLE

SUTTON TOOL COMPANY

STURGIS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 2

END MILLS ARE OUR BUSINESS . . .
NOT A SIDELINE

TO BEST SERVE YOUR NEEDS

For over twenty years our designing and manufacturing abilities have been devoted to producing highest quality end mills. Because end mills are our business, we realize that universal acceptance of our product is obtained and maintained by continuously supplying the best end mills available.

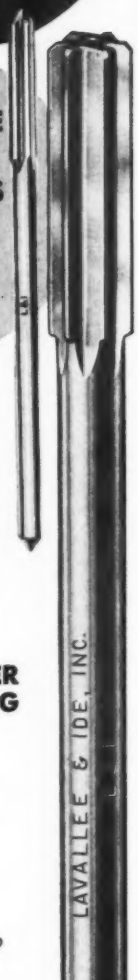
Putnam manufactures and stocks over 1400 standard types and sizes of end mills. Thus, you can quickly and economically select the exact size and type to best meet your needs.

Putnam Distributors from Coast-to-Coast carry large stocks of standard end mills. Contact your neighbor, the local Putnam Distributor, he will recommend the best end mill for specific jobs, give you personalized service, and quickly supply your needs with the finest end mills obtainable.

PUTNAM
TOOL COMPANY
2981 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

Special Size Reamers
ARE STANDARD WITH L&I

TWO MORE L&I EXCLUSIVES ...AT NO EXTRA COST!



DOWEL PIN REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .1230 thru .4995" Sets, tool

OVER & UNDER SIZE CHUCKING REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .124 thru .501" Sets, tool

These reamers are two more reasons why L&I is the source for a **complete** reamer line.
See your L&I Distributor.

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.
CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

NOVEMBER 1957
VOL. XXIII—No. 8
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

Paper is to the publisher what sheet, strip, or bar stock are to the manufacturer of metal products. Recently I had the opportunity to visit the mill that makes the paper for T&P and I jumped at the chance to see it. For sometime I've engaged in a friendly argument with our paper merchant to the effect that he makes more profit selling us blank paper than we make selling it with printing on it. That's one of those arguments which probably never will end. And why should it — it's friendly.

The plant to which I refer is that of the Oxford Paper Company at Rumford, Maine. We always have had reason to be completely satisfied with the Oxford product. And when I went through the plant it quickly became evident why this was true. At every step in the production process was evidence of quality control. From the extraction of the fibres from the logs, to the careful mixing and blending of all ingredients, to the final inspection and packing for shipment, in all steps were obvious safeguards to assure a consistent quality product.

The Oxford Mill at Rumford is the largest fine paper mill under one roof. It produces over 600 tons of fine paper per day. Incidentally, paper mills are highly automated. They have to be and the immense amount of plant and equipment required makes the investment per employee higher than in almost any other type of manufacturing. Oxford is a typical American enterprise in that it produces a quality product at a modest profit which is achieved through astute forward-looking management.

How did you like the feature on Cold-forming in the T&P October issue? Plenty of sweat went into that over a period of about nine months. We'd be interested in your opinions of the Cold-forming series and we would be glad to learn what other subjects you'd like similarly covered.

Cordially yours,

Ray Huebner

Publisher

TOOLING & PRODUCTION

READERSHIP RESEARCH — BPA

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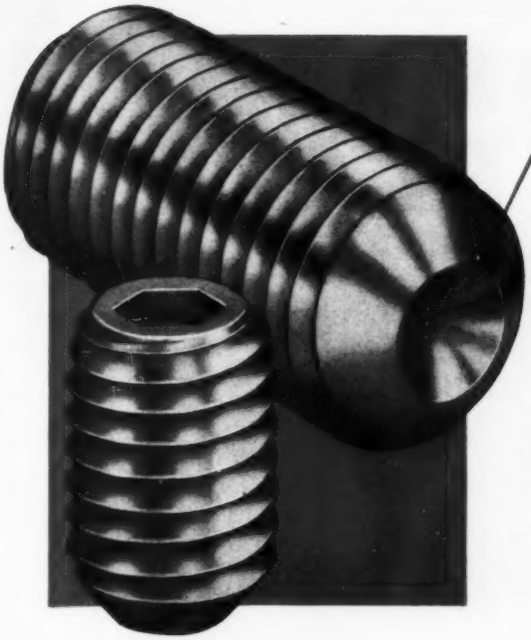


ALLENPOINT will give you a bulldog grip at no premium in price!

Allen's scientific redesign of the cup diameter on set screws gives greatly increased resistance to *withdrawal* torque. You can count on Allenpoint Set Screws to stay tighter longer, under heavy strain and vibrations. This dependable premium performance of Allenpoints is yours to use without increasing the cost of manufacturing your products.

Uniform Class 3A Threads

Allenpoints' smooth, uniform threads prevent off-lead conditions like Fig. 1. With Allenpoints, you have full, even contact between the engaging flanks of the threaded members (Fig. 2) –and a tight friction lock over the entire length of the Allenpoint Set Screw.

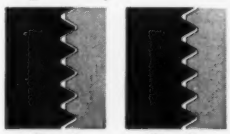


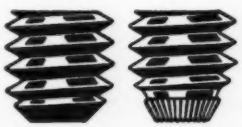
Fig. 1 Fig. 2

Strong, clean, deep sockets allow full wrenching leverage

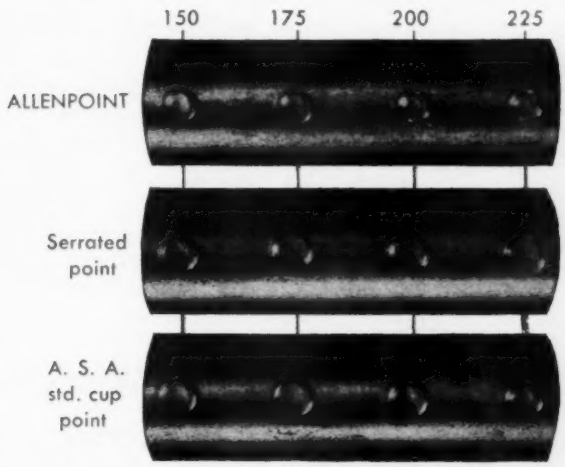
Sockets of Allenpoint Set Screws are cold forged to produce a deeper, smoother socket. No broach chips to interfere with proper seating of the key. This "pressur-forming" preserves the long steel fibers throughout the length of the screw–stronger walls allow maximum tightening torque.

One more full thread on ALLENPOINTS!

Allenpoint Set Screws have one more full thread than serrated point set screws. That means more holding power–especially important when you're using short lengths.



ALLENPOINT's performance compared for you



These actual-size, unretouched photographs show the cup pattern made by Allenpoints, serrated points, and A.S.A. standard cup point set screws in a 3/4" steel shaft. At each degree of tightening force, Allenpoints make a full circle pattern, penetrating deeper for greater holding power.

We'll be glad to send you more information and samples of Allenpoint Set Screws and other Allen Socket Screw products.

Stocked and sold by leading industrial distributors everywhere

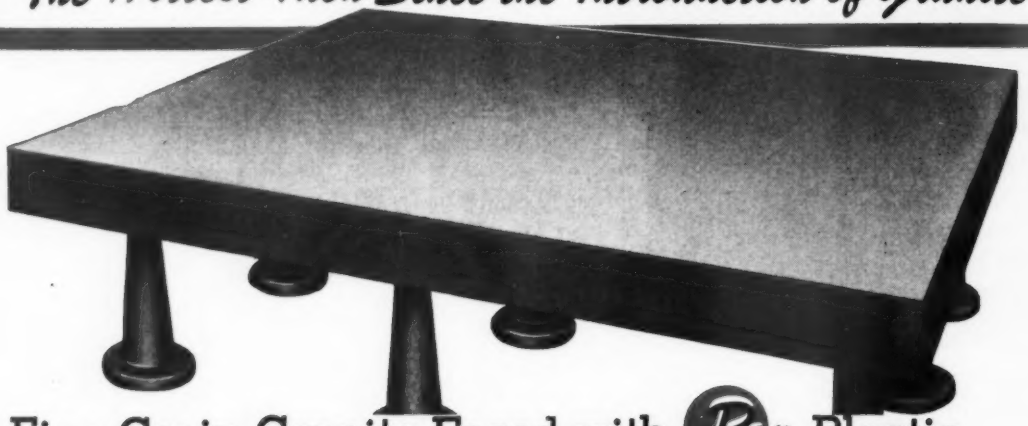
ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

ALLEN HEX-SOCKET SCREWS HEAD

CIRCLE INFORM-A-GRAM KEY NO. 5

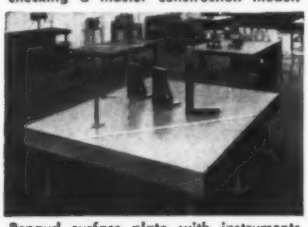
Renaud PLASTIC SURFACE PLATES

The Hottest Idea Since the Introduction of Granite



Fine Grain Granite Faced with Ren Plastic

Three Renaud surface plates aligned for checking a master construction model.



Renaud surface plate with instruments to check critical dimensions.

Dimensions are critical in constructing and checking this master gage for auto roof panel.

Developed by Renaud Plastics, Inc.—Builders of plastic tools, the Renaud surface plate is indeed the most outstanding development in this field since the introduction of granite.

All costly operations to produce a usable granite plate of close tolerances have been eliminated.

The Renaud way does not require laborious grinding and polishing, we simply take the same fine granite and surface it with Ren Plastic developed for this purpose. These plates are accurate within .002 T.I.R. of a true plane across corners, qualified for precision work and well within the required tolerances for steel tools, wood models, patterns and plastic tooling.

LOWER INITIAL COST

Savings on the cost of this type of equipment can be up to 50% of other types of surface plates.

FASTER DELIVERY

There are 8 standard sizes which can be delivered in less than half the time formerly required. Special sizes a little longer.

TRADE IN YOUR USED RENAUD PLATE

Should a Renaud plate need re-surfacing simply order a new plate and upon arrival return your used Renaud plate for generous trade-in allowance.

ALL THE ADVANTAGES OF GRANITE PLUS

the stability of a hard Ren Plastic surface which wears longer and is permanently level

- Won't warp, swedge, rust or corrode
- Non-magnetic—abrasive resistant
- Needs no special care or oiling
- Repair is easier with Ren Plastics

DIMENSIONS

Surface Dimension	Ledges No.	Ledges Ft.	Surface Dimension	Ledges No.	Ledges Ft.
24″ x 60″	0		48″ x 72″	0	
(2′ x 5′)	2	10	(4′ x 6′)	2	12
	4	14		4	20
36″ x 60″	0		48″ x 96″	0	
(3′ x 5′)	2	10	(4′ x 8′)	2	16
	4	16		4	24
36″ x 72″	0		60″ x 60″	0	
(3′ x 6′)	2	12	(5′ x 5′)	2	10
	4	18		4	20
48″ x 60″	0		72″ x 96″	0	
(4′ x 5′)	2	10	(6′ x 8′)	2	16
	4	18		4	28

Accurate within .002″ T.I.R. of true plane across corners.

SHIPPING WEIGHT

100# per sq. ft. for 6″ Thick
135# per sq. ft. for 8″ Thick
170# per sq. ft. for 10″ Thick
200# per sq. ft. for 12″ Thick

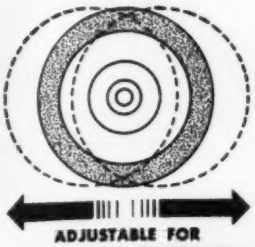
WRITE FOR LITERATURE

Renaud PLASTICS, INC.

5422 S. Cedar Road • Lansing 17, Michigan

PLASTICS FOR INDUSTRIES SINCE 1938

CIRCLE INFORM-A-GRAM KEY NO. 6



ADJUSTABLE FOR OSCILLATING FREQUENCY AND LENGTH OF STROKE

IT OSCILLATES!

SPECIALLY DESIGNED FOR USE WITH

NEW ANOCUT ELECTROLYTIC GRINDING PROCESS

- CUTS DIAMOND WHEEL COSTS
- GRINDS FASTER
- SOON PAYS FOR ITSELF

NEW Hammond ELECTROLYTIC OSCILLATING CARBIDE TOOL GRINDER

Write FOR CATALOG

The *New* Hammond Oscillating Carbide Tool Grinder was designed primarily for use with the Anocut Electrolytic Grinding Process. It can also be used for conventional grinding without the Electrolytic "Power Pack".

A controlled and precise method, the Electrolytic process removes stock electro-chemically. It is *not* to be confused with electro-spark or electro-arc methods. It reduces diamond wheel consumption 80 to 90%.

Outstanding feature is the precision, dynamically balanced, OSCILLATING spindle... with *variable* oscillations per minute and *variable* length of stroke. The operator no longer oscillates the tool . . . the wheel does the work, with greater speed, smoothness, accuracy, and less physical effort.

Hammond OF KALAMAZOO "Good Machinery Since '82"

Hammond Machinery Builders INC.

1631 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 7

GROWING PAINS

The Bay State Abrasive Products Company has announced the purchase of 15 acres of land in the Keith Shaffer Industrial Park, Santa Cruz County, Calif. Plans are being made to build a manufacturing plant and warehousing facilities there. This is the latest step in the company's $2 million expansion program. The company has enclosed a 25,440 sq ft building for new maintenance facilities and a 30,000 sq ft extension has been begun.

◆

Property has been acquired and plans are in progress for a new factory with four times the present manufacturing space, announces Vac-U-Lift Company. The building will have 28,000 sq ft of floor space and another building will house the office and engineering department.

◆

The $5 million Link-Belt bearing plant west of Indianapolis is expected to be finished in 1958. The plant will be about 850 ft long, 400 ft deep, with a two-story office building. All manufacturing operations will be on one floor.

◆

A $200,000 branch foundry at Garland, Tex. is being built by Ampco Metal, Inc. The 15,000 sq ft plant, expected to be in operation by March, will include sand and centrifugal foundries, heat treating facilities, and some machining operations. It also will become the location of Ampco's principal sales and services offices in the southwest. These additional facilities will enable production of bronze castings weighing up to 1,000 lbs each and the supplying of aircraft quality alloys to engineering specifications for a wide variety of services.

Columbia Steel Equipment Company, Inc., a wholly-owned subsidiary of Standard Pressed Steel Company, has announced plans for a 53,000 sq ft addition to its Fort Washington, Pa. plant. This will increase the manufacturing and office space to 150,000 sq ft. The first floor will primarily house relocated warehousing and shipping areas, and expanded office, engineering, research, and development facilities will be on the second floor.

◆

Tube Turns Division of National Cylinder Gas Company will increase its manufacturing area approximately 40% by converting three buildings on property adjacent to its main plant. The $400,000 remodeling job will provide plant facilities for products now in the design and development stage and for expansion of the welding fittings and custom forgings departments. There is a fourth existing building that provides additional floor space for the expansion program.

◆

Under construction is Allen Manufacturing Company's new main office and manufacturing plant at Bloomfield, Conn. The new plant, will manufacture Allen set screws and hex wrenches. When completed the plant will comprise a 250,000 sq ft single-story factory section and a two-story, 20,000 sq ft office building. The building will incorporate a 10,000 sq ft pilot plant in which new machines, materials, and manufacturing processes will be tested prior to use in production.

◆

Firth Sterling Inc. announces the construction of its fourth tungsten carbide sintering facility, to be located in Los Angeles. Scheduled to be in production by December, it will manufacture carbide cutting tool tips and blanks.

◆

The Somma Tool Company, Inc., manufacturer of circular form tools and blanks, has moved into its new plant located on Scott Rd., Waterbury, Conn.

P&W

BIRMINGHAM 3, Alabama
1717-19 Comer Building
Tel: ALpine 1-0668

BOSTON (Cambridge 42), Mass.
238 Main Street
Tel: KIrkland 7-5875

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Tel: UNiversity 8804

CHARLOTTE 4, North Carolina
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Tel: EDison 2-7774

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Tel: DIamond 1-1070

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Tel: GLenview 3-7650

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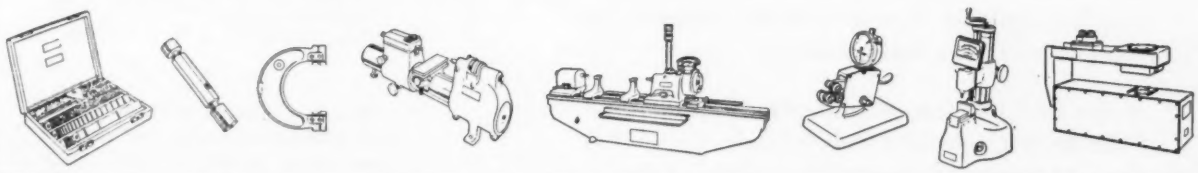
INEXPENSIVE HIGH PRECISION . . . for external gaging. P&W *Sigmatic* Comparators combine the simplicity of mechanical operation with magnifications up to 5000X. Easily portable, require no outside power source.

EXTREME VERSATILITY . . . P&W *Air-O-Limit* Comparators use a variety of internal and external attachments to check a very wide range of products. Readily engineered to meet *your* special requirements.

FOR THE ULTIMATE IN GAGING ACCURACY . . . P&W *Electrolimit* Comparators combine mechanical gaging with electrical magnification up to 100,000X. Errors in "tenths" and "hundredths" are read easily, accurately.

FOR MORE ACCURATE PRODUCTION . . . a P&W *Supermicrometer* is ideal for daily use at the machine or inspection bench. Reads direct to .0001". Controlled measuring pressure eliminates operator's errors.



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PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 9

Cold-Heading Costs Far Less . . .

WITH P&W-JAQUITH CARBIDE HEADER DIES, PUNCHES, CUT-OFF QUILLS AND KNIVES . . .

Compared with steel tooling, they run longer, produce more and require lower inventories. Improved quality increases product acceptability, cuts inspection costs. These carbide tools are now offered as stock items for National and Waterbury Farrel Cold Heading machines. Specials can be furnished on short delivery from available blanks.

Write now for complete information. Jaquith Carbide Division, Pratt & Whitney Company, Inc., 15 Stewart Street, Lynn, Massachusetts.

JAQUITH CARBIDE
DIVISION OF PRATT & WHITNEY COMPANY, INC.
SPECIAL DIES • COLD HEADER PARTS • WEAR PARTS

CIRCLE INFORM-A-GRAM KEY NO. 10

Avildsen Tools and Machines, Inc., announces recent personnel changes. **Fin Jensen** joins the company as district sales manager of the central and western New York territory of the Celfor Tool Division, and the recently appointed Southern California sales manager, **Lou Herman**, has headquarters at the company's Twist Drill and Reamer factory in Glendora. **Parker Jameson**, with headquarters in Dallas, has been named by Republic Drill and Tool Co. as its district sales manager for Texas, Oklahoma, Louisiana, and Arkansas.

◆

The midwest division of Allmetal Screw Products Company will be served by sales manager **Thomas W. Schaid.** The territory includes Illinois, Indiana, Iowa, Minnesota, Missouri, Nebraska, North and South Dakota, and Wisconsin.

◆

Robert Bevis is now serving as sales manager, domestic sales, for The Cincinnati Milling Machine Co.

◆

Norton Co. announces the appointment of **Henry G. Morensen, Jr.**, as district sales engineer for the Grinding Machine Division in the Detroit area.

◆

D. J. Bond has joined the staff of the Special Products Division of Colonial Broach & Machine Co. as sales representative in the Detroit area.

◆

District sales manager in the Cleveland Sales office of the Verson Allsteel Press Co. is **N. J. Kassnel.**

◆

The appointment of **John M. Mele** as Philadelphia district manager has been made known by Bay State Abrasive Products Co. He will supervise the company's activities in eastern Pennsylvania, southern New Jersey, Delaware, Washington, D. C., Maryland, and Virginia. **Lloyd M. Price** has been appointed an abrasive engineer for the states of Minnesota, and North and South Dakota.

Frederick H. Edwards, Jr. has been appointed field representative for the Atrax Co. in the New England territory.

◆

Donald W. MacLeod has moved into the position of sales supervisor in charge of Elgiloy, for the Abrasives Division of Elgin National Watch Co.

◆

Vice president of Colonial Broach and Machine Co., **Robert N. Kendall,** is moving to Milwaukee to take charge of the company's Wisconsin area.

◆

Prentiss L. Smith serves as sales manager of spindles for the Bryant Gage and Spindle Division of the Bryant Chucking Grinder Co.

◆

The Motch and Merryweather Co. has made known the appointment of **Clarence W. Raufus** as assistant district manager of the Cincinnati sales office.

◆

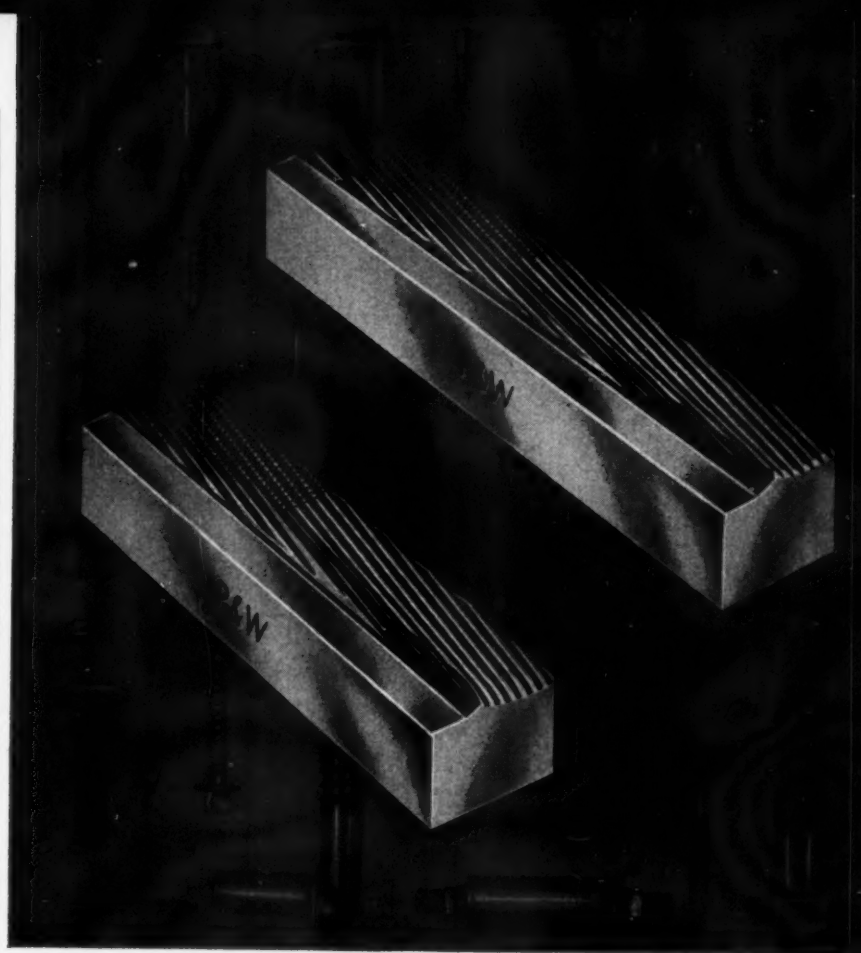
Eight district and mill-branch staff personnel have been appointed to new positions by The Carpenter Steel Co. **Lester E. Cooney,** has become assistant to the vice president in charge of sales, and **Paul W. Holtz** has been advanced to district manager of the Chicago-Milwaukee-St. Louis area, succeeding Mr. Cooney. William J. Stephens now serves as branch manager in Chicago. Other promotions include **M. R. Gerhart,** to St. Louis branch manager; **Martin J. Holleran,** northern New Jersey district manager; **Kenneth C. Largent,** branch manager of the San Francisco mill-branch warehouse; **Donald R. Ross,** assistant branch manager of the Dayton area; and **James H. Magee,** assistant branch manager in Cleveland.

◆

The promotion of **Lester A. Shea** to eastern division manager has been revealed by Lindberg Industrial Corp.

◆

Howard Gamble has been appointed to the New England field sales staff of the Press Division of F. J. Stokes Corp. He will work out of the district office in Portland, Conn.



ROLLING Produces More Accurate Threads...FASTER!

WITH P&W-STERLING THREAD ROLLING DIES

. . . Thread Rolling is rapidly replacing older production methods. Long-wearing P&W-Sterling Dies produce threads that are more uniform and accurate than cut threads and have a hard, burnished finish. Important savings in material are realized. Production rates are very high, production costs low. Sterling Dies are stocked and sold by the P&W Branch Office near you.

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DIVISION OF PRATT & WHITNEY COMPANY, INC.

THREAD ROLLING DIES FOR ALL APPLICATIONS

CIRCLE INFORM-A-GRAM KEY NO. 11

Talk of the Month

Technology and People

by James T. O'Connell
Under Secretary of Labor
U. S. DEPARTMENT OF LABOR

THERE ARE CERTAIN PERSONS who would maintain that you cannot talk about technology and human beings at the same time. It is my position that you cannot talk about them separately.

A profound force has been developing in the United States since the introduction of the cotton gin and the spinning jenny 200 yrs ago. This force, which we call technological advance for want of a more precise term, has been a great agent for good. Through increased industrial production we have created a widely distributed material wealth, and the citizens of this country are better off than any people have ever been anywhere on earth. At this moment, more than 67 million Americans are working at jobs which pay them record high wages. Seventy-three percent of our people own automobiles, and 60% of them own or are in the process of buying their own homes. We have 38 million television sets and 45 million refrigerators.

This is impressive testimony to the potential of technology to provide material wealth. But it will not do to forget that technology's material contributions to our society are incidental to the total character of our Nation and the total welfare of our people.

Our technical ingenuity has given us, at last, the means to abolish poverty, illiteracy, disease, hunger, and discrimination. To a very great extent we have used those means to good advantage. Generally speaking, we have moved ahead fast enough in the social field to ensure that technological progress has been translated into social progress. Unemployment insurance, workmen's compensation, social security, fair employment practices are all designed to protect the worker population against the vicissitudes of technological progress. Two hundred years ago, the weavers of England rioted and smashed the automatic looms which had made their skill obsolete. Today we try to foresee new devices and new processes, and to re-train our workers for jobs that will give them new opportunities for occupational competence and personal satisfaction.

Technology has been such a benevolent force in this country that I sometimes think that we are too much inclined to dwell on its good results and too little disposed to remind ourselves of its dangers. It is well to remember that the marvels of modern technology — the electronic brains and the nuclear power plants in which we take such pride — do not represent true progress except to the extent that they promote human welfare. A television set, an automatic factory, a rocket airplane, a nuclear power plant are not good in themselves, nor are they ends in themselves.

Danger of Moral Coma

Those of us who are deeply involved in technology are always in danger of falling into a moral coma. We have to watch ourselves or we will begin to think that all good things will result for humanity *automatically* if we just build a big enough and efficient enough industry.

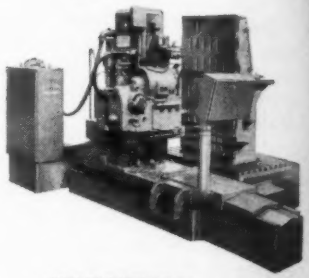
The first case of this attitude that I can find in history involves a Roman water commissioner named Sextus Julius Frontinus, who had charge of the imperial aqueducts, for about five years beginning in 97 A.D. Speaking of his aqueducts, Frontinus said: "With such an array of indispensable structures, carrying so many waters, compare the useless, though famous, works of the Greeks."

Frontinus disappeared from history in 103 A.D. He was survived not only by the Parthenon, but also, unfortunately, by his point of view. The Romans, bemused by the efficiency of their aqueducts and their war machines, went right on preferring the functional, too often to the exclusion of the aesthetic. The result was the enervation of the in-

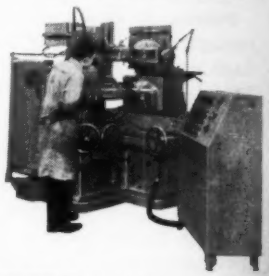
. . . Continued on page 15

An address presented at the recent Executives' Day luncheon of the Instrument Society of America in Cleveland.

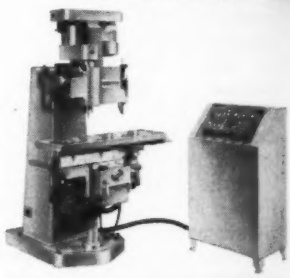
A P&W Tracer-Controlled MILLER FOR EVERY JOB



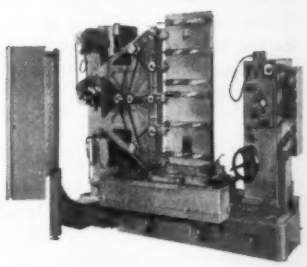
KELLER TYPE BG-21 . . . a powerful, versatile machine in a range of sizes from 5' x 2½' to 10' x 4', in single and 2-spindle models.



KELLER TYPE BL . . . a compact, powerful Tracer-Controlled Miller for work within the range of 36" x 20". With all new Keller features. Single and 3-spindle models.



VELVETRACE® MILLING MACHINE . . . duplicates the finest detail with extreme precision. New, non-contacting tracer control cannot damage the softest, most fragile 3-dimensional models.



AUTOMATIC DUPLICATION MACHINES . . . automatically reproduces original forging dies and glass or plastic molds with remarkable precision and detail. Two versions, one for molds, one for dies, with 1, 2 or 4 spindles.

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CIRCLE INFORM-A-GRAM KEY NO. 13

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To machine the WORLD'S LARGEST DIE,

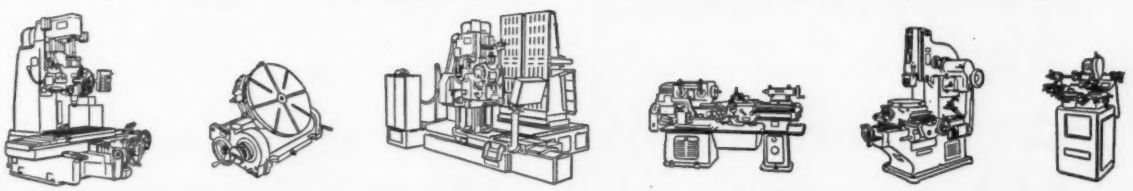
ALCOA chose the Keller . . .

. . . AUTOMATIC TRACER-CONTROLLED MILLING MACHINE

Consisting of two halves, each weighing 30 tons, this is the world's largest closed die block. Designed to forge aluminum backbones of fuselage and wing structures for the new multi-jet Martin SeaMaster, this giant die was produced on a P&W Keller BG-22 at the U.S. Air Force Heavy Press Plant operated by Aluminum Company of America.

Chances are that your own workpieces aren't as large as this die, but there is a Pratt & Whitney Keller Automatic Tracer-Controlled Miller for *every* worksize requirement. *Every* Keller Machine offers the same important advantages: fast, accurate reproduction of complex 3-dimensional shapes, extreme versatility and an overall ability to produce highest work quality economically. These advantages will also make Keller *your* first choice for a wide variety of die, mold and other hard-to-handle 2- and 3-dimensional milling jobs. Write now for complete information.

Pratt & Whitney Company, Incorporated, 15 Charter Oak Boulevard, West Hartford, Conn.



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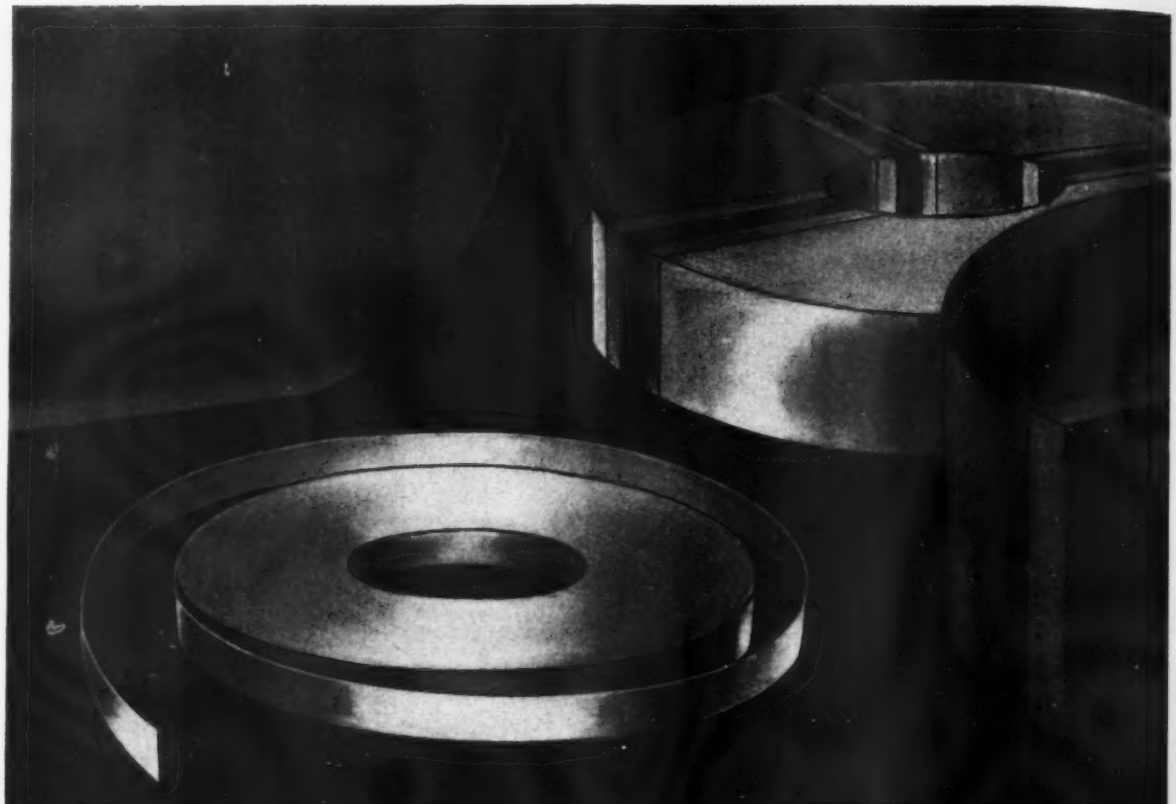

UDDEHOLM'S Swedish Strip Steels
Still Your Best Quality Buy

If you buy quality in strip steels, Uddeholm is your logical source. Uddeholm's fine Swedish strip steels have been appearing in superior products for almost three centuries. A combination of the world's purest iron ores and traditional Swedish steelmaking skill guarantees you matchless quality in every shipment. In fact, whenever users see an exceptionally fine strip steel product they're apt to ask "Is it Uddeholm?". Many such users specify it beforehand.

Uddeholm cold rolled strip steel is easy to work with. Its uniform composition, flatness, straighter edges and closer tolerance accuracy make any job easier—and more economical. *It will give better performance.* You'll get longer product life, greater fatigue resistance, more resiliency and toughness. *It's available in a wide variety.* You can choose from a complete selection of grades, sizes, tolerances and finishes—in combinations to meet any requirement. Widths range from ⅛″ to 16¼″; thicknesses from .001″ to .125″. Tolerances can be held to ±.00008″.

Uddeholm Strip Steels are found in many applications including Stainless Steel products, feeler gauges, intricate machine parts, all types of blades and springs, and countless others. Slitting and edging facilities are also available.

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CHICAGO: Frank J. Mackin, Leroy E. Marshall, 55 East Washington, STate 2-1649 DETROIT: Warren H. Nugent, 17304 Lahser Road, KEnwood 5-6340
PHILADELPHIA: Frank T. Campagna, 34 South 17th Street, RIttenhouse 6-4290

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 12

dividual, the collapse of the state, and the death of a civilization.

I am not saying that this is going to happen to us. I'm just saying that it has happened before, and might again, to nations which do not keep it in mind that the individual is the subject and not the object of progress. He is the basis of society. His welfare transcends all. Technical organizations, like political institutions, are founded by him to secure and enhance his happiness.

Experience has taught us that this principle is not merely moral and philosophical. It is also eminently practical. The efficiency of industry does not depend on automatic devices, but upon the individual skill, competence, and motivation of the people who make, man, and repair them.

The United States, which is now undergoing a truly formidable population growth at the same time that it is acting as the central power of the free world, has more need than ever to cherish the individual. We have arrived at a point where nothing less than the maximum education, training, and opportunity for each of our people will suffice to keep America prosperous and safe.

We have been traveling toward this moment for 200 yrs, in the shift from handicraft to machines in the 19th Century, in the advent of mass production techniques in the early 20th Century, and, now, in the rapidly growing use of transfer machines, electronic computers, feedback controls, and all the other devices with which you are on such intimate terms.

Individuals Gain Importance

Each of these technological developments has generated anxiety for the individual. For nearly two centuries Western man has been worried that he might be replaced by the machine. Actually, the opposite has happened. Instead of losing his identity in a mechanized society, the individual has become steadily more important. As our tools and our methods have become more and more complex, it has become more and more apparent that the human hand is the tool of tools, and that there is no substitute for human skill. Each new advance in technology has given the individual a chance for growth, for increased economic security, for more satisfying work experience.

It is in this light, I believe, that we should regard the newest developments in technology. So long as we continue to think that people are more important than apparatus, the dignity of the individual is in no danger. The intricate machines and methods of the new age offer the worker opportunities for fulfillment as no other machines and methods ever have. The worker arrives at this new stage of his development with 200 yrs of almost constant industrial change behind him. Skills have grown steadily and logically over that span. So have the social safeguards against economic disruption and individual discomfort. We know what to expect, and what to guard against.

From our experience with the spinning jenny and the assembly line, we know two things, among others:

1. Changes in technology result in changes in the nature of work.
2. Because the nature of work is changing, and will change more, the skills of workers will also have to change.

. . . *Continued on page 20*

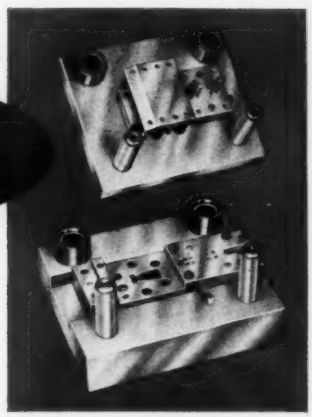
DO IT RIGHT THE FIRST TIME...

with

HARIG

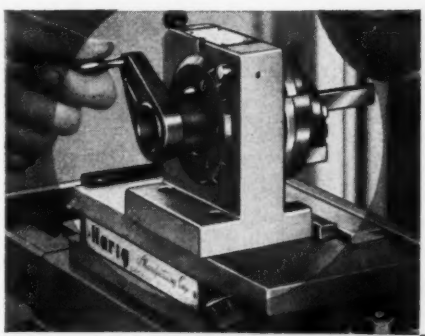
Precision-Made

TOOLS & DIES



PRECISION DIE MAKERS ▶

All types of dies including carbide and lamination dies.



◀ THE NEW HARIG GRIND-ALL FIXTURE

Fast, accurate perforator grinding attachment—hand crank for easy rotation of index plate, single locking screw for making quick set-ups.

HARIG's TML 6x12 SURFACE GRINDER ▶

Designed for quick easy operation, sturdy, rigid construction and low maintenance with economy in mind.

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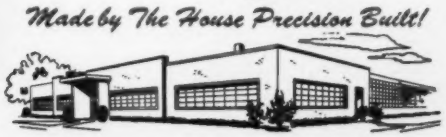

CIRCLE INFORM-A-GRAM KEY NO. 15

HARDINGE
ELMIRA, N.Y.

MASTERS and PADS

FOR BETTER PERFORMANCE — BETTER PRODUCTION

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PROFITS

STYLE "S"
MASTER COLLETS and PADS
The Only Master Collet with
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THIS AIR CYLINDER ACTS 78 MILLISECONDS FASTER

Take a 2½" bore conventional air cylinder, connect it to a remote valve with 6 feet of ⅜" diameter hose. *123 milliseconds* after the valve is operated, the air cylinder's piston begins to move.

Now take a Bellows Air Motor (the air cylinder with the *built-in* valve) of the same bore. The response time for the Bellows Air Motor is *45 milliseconds* . . . only 27% of the time required by the remote-controlled air cylinder.

Multiply that time-saving over an eight-hour shift . . . using, say, a six-parts-per-minute operation . . . and you receive 44 more parts each shift from your machine when you use a Bellows Air Motor with the built-in valve.

"Forty-four more parts each shift?" Not many, perhaps. But the multipliers . . . number of machines, number of shifts, length of production run, any one or all of them . . . can send the "44" up into respectability very quickly. In fact, it can mean 33,000 more parts per year from a single machine.

Quick response is only one of many advantages integral valving offers the user of air cylinders. Positive speed control; uniform power thrust; less air consumption; no cumbersome piping . . . all of these make an impressive total of cost saving advantages.

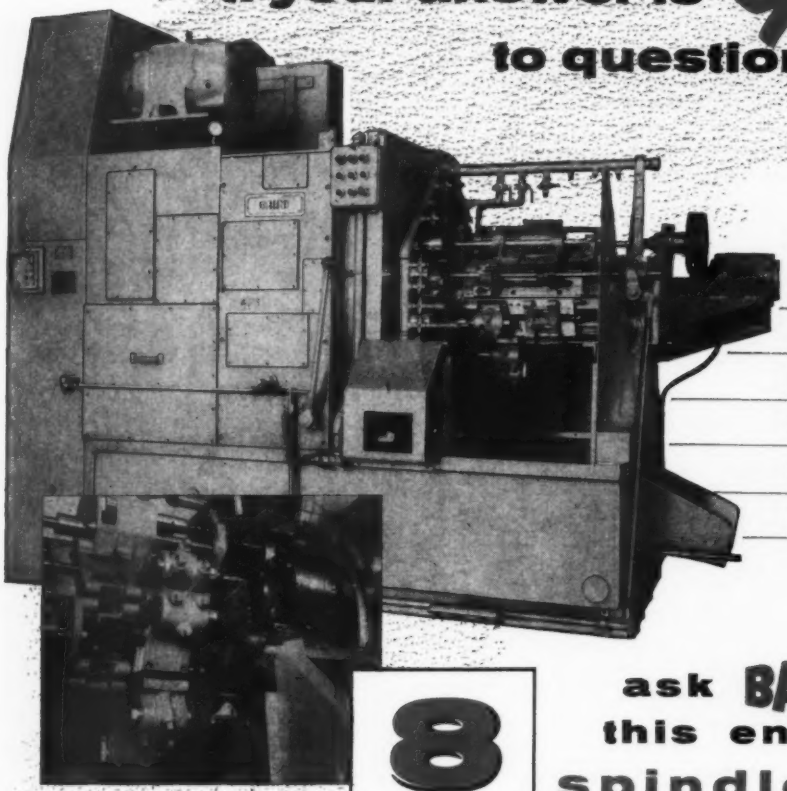
GET THE FULL STORY — Write for Bulletin BM-25. Twenty pages of helpful data every production man can use in his battle for lower costs. Akron 9, Ohio. In Canada: Bellows Pneumatic Address Dept. TP-1157, The Bellows Co., Devices of Canada, Ltd., Toronto, Ontario.

9248

The Bellows Co.
AKRON 9, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 17

If your answer is *yes* to questions like these:



Does your work call for . . .

HIGHEST PRODUCTION RATES?

MAINTAINED HIGH PRECISION?

EXCEPTIONAL TOOLING VERSATILITY?

PARTIAL OR COMPLETE AUTOMATION?

DEPENDABILITY FOR LONG RUNS?

LOW MACHINE AND TOOL MAINTENANCE?

Rear view of tooling area. Note installation of drilling spindles at top.

8 ask BAIRD about this entirely NEW spindle chucker

As every machine tool man knows, BAIRD Chuckers are the mainstay of the automotive piston production lines . . . and have for many years maintained this position of leadership in high speed, high precision and EXTREMELY DEPENDABLE production.

Now, out of this background of experience, Baird engineers are proud to present the NEW MODEL 78H 8-SPINDLE HIGH SPEED AUTOMATIC CHUCKING MACHINE.

This machine continues the well-proved basic features of previous Baird chuckers PLUS very much expanded capacity for operations and tooling. In addition to such advantages as controlled feeds and speeds for each spindle and independent strokes and feeds for each cross slide, the new universal two-stroke cross slides, with 3" max. stroke, are interchangeable among three positions covering six spindles. Individual longitudinal slides are arranged for one or two cutting strokes, and also for separate operation when used in tapping or drilling.

Heavy duty main drive includes provision for use of 50 h.p. motor and timing belt drive components. There is also provision for convenient power take-off as required for tooling attachments. All critical bearings are pressure lubricated with meter-controlled pressure lubrication to cross slides as well as tool slides. Power cranking is standard.

Model 78H is designed for installation of latest developments in special tooling and fully automatic control, with single or double indexing, automatic chucking, auto load and unload.

Clean and open design in work and tooling areas makes even complex set-ups less costly to install and much easier to maintain.

For manufacturers who can use its tremendous production potential, this important new machine represents an outstanding step forward in unit cost reduction. You are cordially invited to send us an outline of your production requirements for study and recommendations. Write Dept. TP.

BAIRD about it

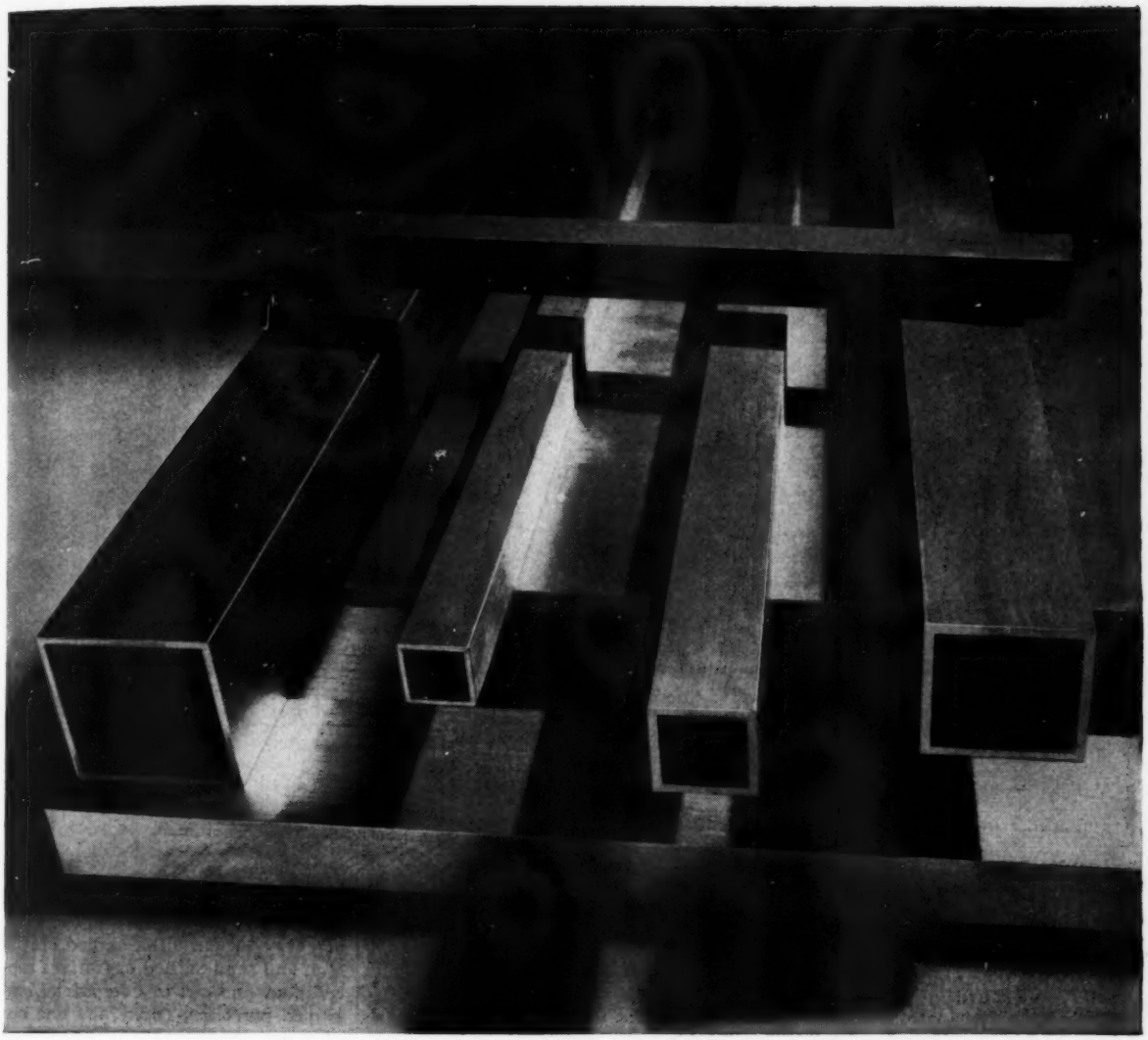
THE BAIRD MACHINE COMPANY • STRATFORD, CONN.

Ask Baird about these other major aids to high production at low cost.

High Speed Automatic Multiple Transfer Presses • Automatic 12-Station Duplex Turning Machines • Vertical Continuous Lathes • Automatic Four-Slide Machines • Press-Formatic Flat Metal Forming Machines • Barrel Finishing Machinery • Specialized Machinery for Chain and Roller Chain Production, Garment Hook and Eye Production • Precision Bench Presses

IBA57

CIRCLE INFORM-A-GRAM KEY NO. 18



Try this new square magnesium tubing

Now—from your Dow magnesium distributor—square extruded tubing for easier construction of jigs, fixtures, platforms and dollies

Square magnesium tubing combines light weight with strength, rigidity and dimensional stability. Used with magnesium tooling plate, it permits simplicity of design and construction of assembly jigs, testing fixtures and stands, movable platforms, dollies and many other tooling applications.

The square shape offers large areas of contact between members for added strength, provides flat work surfaces. It's easier to weld, easier to cut and fit, easier to assemble—will save you time and effort in both construction and in use.

Square extruded magnesium tubing, as well as magnesium tooling plate, is available from stock through the Dow magnesium distributors listed below. Contact the one nearest you next time you have an application for a light, strong, easy-to-fabricate tooling material. THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 1420W.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill., Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Co., Los Angeles, Calif.

YOU CAN DEPEND ON DOW

CIRCLE INFORM-A-GRAM KEY NO. 19

MACHINE PRODUCTS

Your Complete Line Source for . . .

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WHEELS & HANDLES

Cadmium plated and ready for immediate delivery in the style, size and quantity of your choice.

PRECISION SURFACES & ACCESSORIES

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ANGLES • VEE BLOCKS
STRAIGHT EDGES
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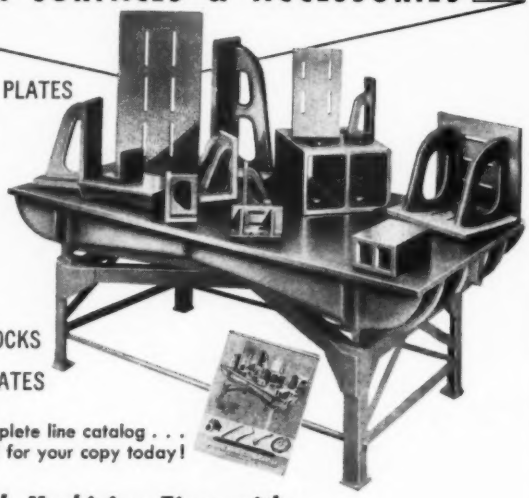
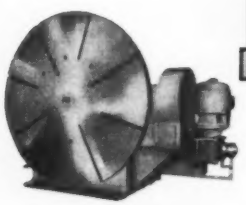
PARALLELS • CUBES
ALUMINUM ANGLES
ALUMINUM HEIGHT BLOCKS
ADJUSTABLE ANGLE PLATES

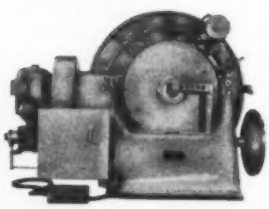


Free! Complete line catalog . . . send for your copy today!

Save Checking and Machining Time with

ROTAB *Rotary Tables*





Consider just a few of Rotab's many advanced engineering features. Parts can be rotated to any degree, adjusted to any angle from vertical to 30° below horizontal . . . no need, in most cases, for more than one set-up. Mechanical and optical setting systems are simple to use, easy to read and *highly* accurate . . . radial and angular settings can be measured *within* 5 seconds of true position! In addition, motor-powered rotation and tilting facilitate fast, precise positioning.

Consider too, Rotab's versatility. It can be used for a variety of inspection and quality control operations . . . or for tool room machining. Get all the details. Write Machine Products today!

PRECISION ENGINEERED CHECKING AT ITS BEST!

MACHINE PRODUCTS *Corporation*

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CIRCLE INFORM-A-GRAM KEY NO. 20

. . . Month's Talk from page 15

Anticipate New Demands

Our task, as a Nation, and as individuals, is to anticipate what skills the new technology is going to demand, and to make sure that the required skills will be available when and where they are needed.

A glance at the patterns of the past gives us a pretty good idea of what we can expect in the future. If you'll give me a moment, I think that I can nail down a trend for you.

Over the long pull, technological progress has not resulted in the displacement of workers. The labor force has continued to expand at about the same rate as the population itself. What has happened is that workers have moved around in the labor force — from industry to industry, and from occupation to occupation.

There has been a marked shift, in this century, from the goods-producing industries to the service industries. Between 1919 and 1956, the number of people in goods-producing industry increased by only 2.6 million, but the number in service industries increased by 17 million.

We have been transformed, in 50 yrs, from a predominantly agricultural country to a predominantly industrial country. In 1910 one out of every three persons worked on a farm. Today, less than one in 10 is so employed. In 1910 one of every eight persons was an unskilled laborer. Today, the ratio is only one out of every 16. In 1910, skilled craftsmen and semi-skilled operatives represented one out of every four employed persons. Today, it's one out of three. Most dramatic of all, the ratio of white collar workers has increased since 1910 from one out of five to two out of five.

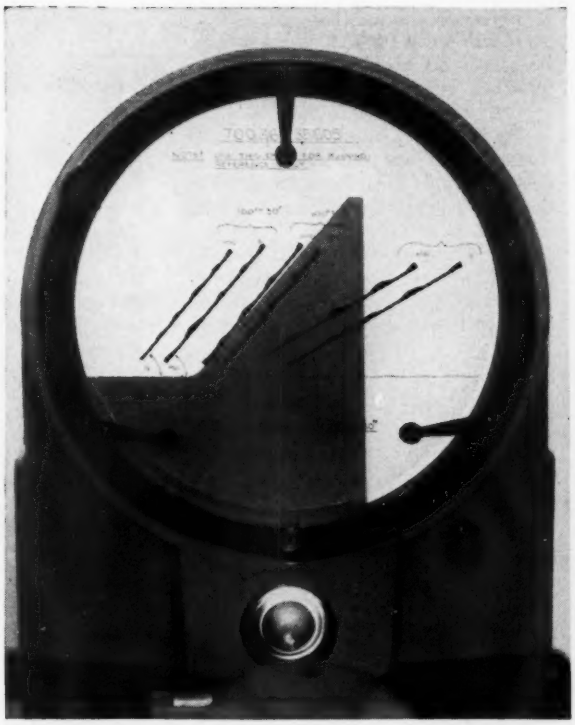
The conclusion fairly jumps at us. Advancing technology does not replace human labor. It creates a snowballing demand for more and better workers — better educated, better trained.

Just how this demand will operate in the next few years can be seen in an intensive study recently completed by the U. S. Department of Labor. Let me give you the basic points briefly:

- For every 100 professional and technical workers we had in 1955, we will need 137 in 1965.
- For every 100 managers, officials and proprietors in 1955, we will need 122.
- For every 100 clerical and sales workers, we will need 127.

. . . *Continued on page 22*

1–A typical MS aircraft bolt has a radius tolerance of .031-.041 on the fillet where the head joins the shank. By placing up to 9 radius drawings on a single overlay chart, a number of machine operators can check fillets during production.



2–Another typical job at Standard Pressed Steel Company involves checking the angularity of a 100° flush head bolt to ½°. Angularity is checked at the same time that the radius is measured to .0015″ (limits are .016-.019).

How Kodak Contour Projectors help keep gage inventories low in production checking

Standard Pressed Steel Company—manufacturer of aircraft bolts, socket screws, and other close-tolerance fasteners—once needed as many as 26 radius gages to check the fillets of *each type of bolt* it made while the bolts were in production.

Multiply this figure by the number of types of fasteners . . . add the gages required for checking other dimensions such as root radii—and you get an idea of the vast inventories involved in conventional inspection methods.

Now SPS does much of its production inspection by optical means with Model 8 Kodak Contour Projectors—and gage inventories have been slashed for these 4 important reasons:

- Light in weight, the Model 8's can be readily moved, used where needed on the production line.
- A single Contour Projector can serve several machine operators, since one screen chart can show tolerance limits for as many as nine different radii. (Fig. 1)
- A single chart can check several dimensions at once on a given part. (Fig. 2)
- By interchanging charts, the same Projector can be used to check a variety of parts—bolts, flat-head screws, or socket screws. (Fig. 3)

Model 8 and other Kodak Contour Projectors can help simplify your measurement and inspection problems, too. For full details write for our illustrated booklet, "Projection Gaging with Kodak Contour Projectors," or ask for the name of the Kodak field representative in your area. He'll be glad to advise you.

3–Here an operator uses a Model 8 Projector to check the root radius of threads to tolerances on the order of .002″.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Apparatus and Optical Division

the KODAK CONTOUR PROJECTOR

Kodak

CIRCLE INFORM-A-GRAM KEY NO. 21

. . . Month's Talk from page 20

- For every 100 skilled craftsmen, we will need 124.
- For every 100 semi-skilled operatives, we will need 122.

On the other hand, for every 100 farmers and farm workers we had in 1955, we will need only 85 in 1965; and for every 100 unskilled workers, we will need only 97.

This adds up to 10 million new people in the labor force between 1955 and 1965 — in itself, a small problem. At the rate the population is growing, we will easily have that many new workers.

Number Is Adequate; Are Skills?

They will be adequate in numbers. But will they be adequate in skills to produce the necessary $560 billion worth of goods and services for a population that will be between 190 and 200 million persons?

They can be — if we open opportunity and facilities for education and training to everyone who is capable of profiting by it, and if we judge each aspirant to a professional or skilled job on his merits and qualifications as an individual.

The reason why it is of increasing practical, and not just moral, importance to get rid of senseless discrimination is this: Most of the 10 million additional workers we can get in 1965 will be women, and older workers, and the very young. Many of them will be members of minority groups. And proportionately fewer of them will be men in the prime working ages between 25 and 44 than has ever been the case.

The employer who believes he can staff his plant during the next 10 years with bright young men between the ages of 25 and 34 is in for a disappointment. There will be nearly ¾ million fewer of them than there are today. This means that the men who are in this age group must be offered maximum opportunities for training and self-development.

There are some indications that they are not being offered those opportunities in the measure that they need them. Many companies are operating good training programs to produce the people they need currently and the people they'll need for growth in the years ahead.

Many others are relying on other methods. To see what they are, you need only look at the want ads in your local newspapers. There are columns upon columns of ads for skilled workers — from machinists to engineers. Employers know better than anyone else that practically no one with a developed skill is unemployed in the current tight labor market.

Their object, therefore, is plain and simple pirating. They hope to induce skilled workers to leave another employer. This satisfies the immediate need for a worker on a specific job, but it also creates problems because it does not increase the skills available in the labor force. It just moves the supply around a little.

Train — Don't Pirate — Workers

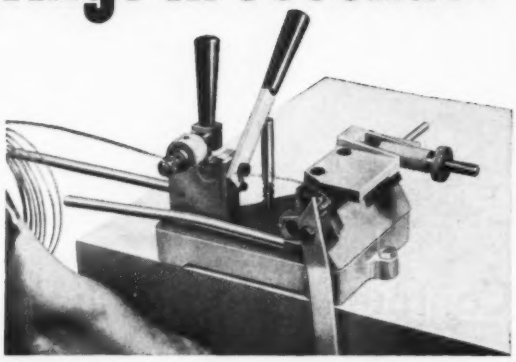
Pirating is a short-sighted and impractical policy. I am convinced, from my own experience in industry, that if we spent half the money on training that we are now spending on this kind of recruitment, we'd have no significant skill shortage. And we would have a more stable and productive skilled work force because we would not be creating gaps in the productivity of individuals as they change jobs and take time to reach maximum efficiency on a new job.

The only way to increase the

. . . Continued on page 33

Make springs in seconds!

Save costly special orders WITH THE NEW



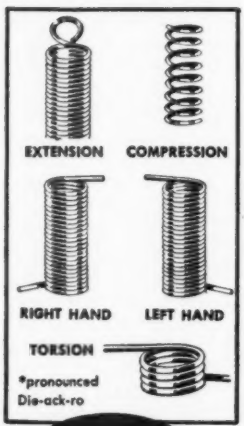
DI-ACRO* Spring Winder!

This unique machine eliminates costly special spring orders, saves valuable waiting time. Winds flat, torsion, compression and extension springs to 1½" O.D. Handles round, flat and rectangular wire to ⅛" dimension. Note exclusive features in the hand operated Di-Acro Spring Winder which assure accurate tension and fast operation without special experience or skill.

NEW **TENSION CONTROL**—Simply adjust to desired tension—the control keeps it uniform, for winding one spring or hundreds, and releases when each spring is wound.

NEW **WIRE CUT-OFF DEVICE**—After spring is wound, release tension and use cut-off lever to quickly cut spring to desired length.

NEW **CAM LOCK**—Simply feed wire under cam, turn handle and wire is securely locked to arbor while spring is wound. No threading required.



FREE ENGINEERING SERVICE

Send us your spring forming problems—samples or dimension sketches—together with sufficient test material, and let us wind some sample springs for you free of charge. No obligation.
32-Page Catalog gives complete details on all Di-Acro Precision Machines.
SEE Di-Acro Exhibit, Booth No. 1410, National Metal Exposition, Oct. 8-12, 1956, Cleveland Public Auditorium, Cleveland, Ohio.

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO. • 315 8th Ave. • Lake City, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 22

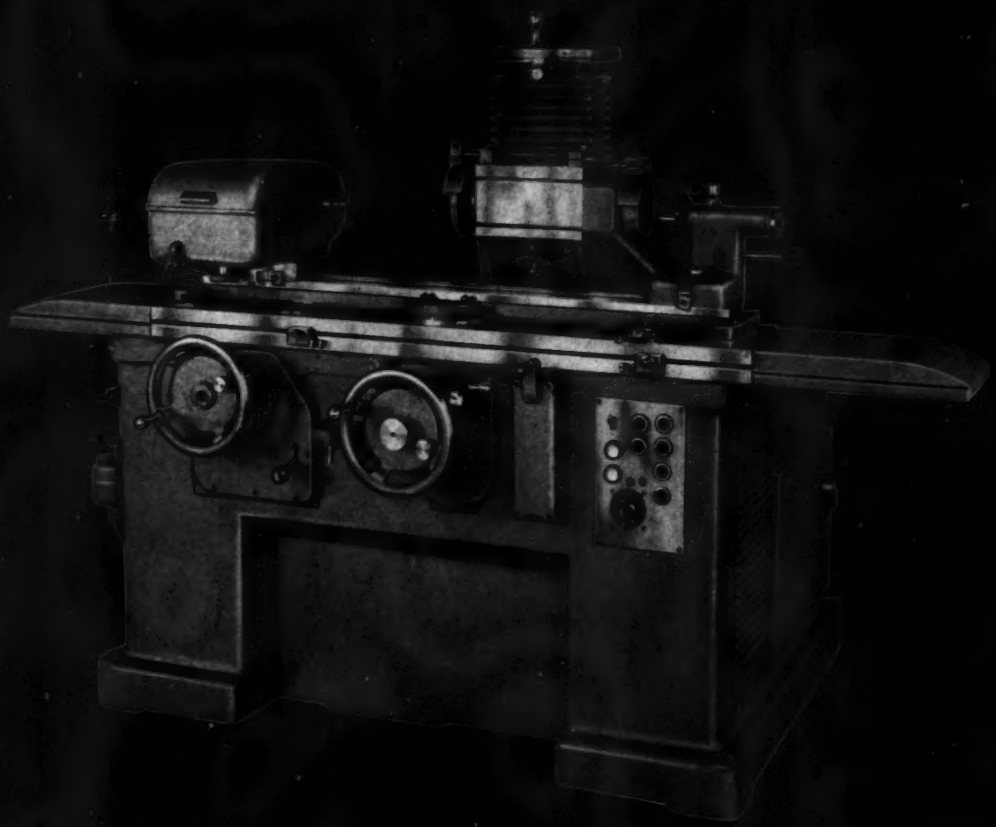
VERSATILITY AND PRECISION TEAMED FOR PROFIT...

COVEL No. 32
UNIVERSAL AND TOOL GRINDER

As a man responsible for the profitable operation of your department or plant, you recognize the value of a machine which teams versatility with precision—does several different jobs, and does them well. Such a machine is the Covel No. 32!

On your internal, external and circular form grinding—on your tool sharpening operations—No. 32 reduces costs, increases your profit margin.

For convincing facts on this new 12 x 30 universal and tool grinder, with infinitely variable table and headstock speed control, mail the handy coupon right now!



COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN
Dept. TP-117

HYDRAULIC & HAND FEED
SURFACE GRINDERS • UNIVERSAL
CUTTER & TOOL GRINDERS • DRILL GRINDERS

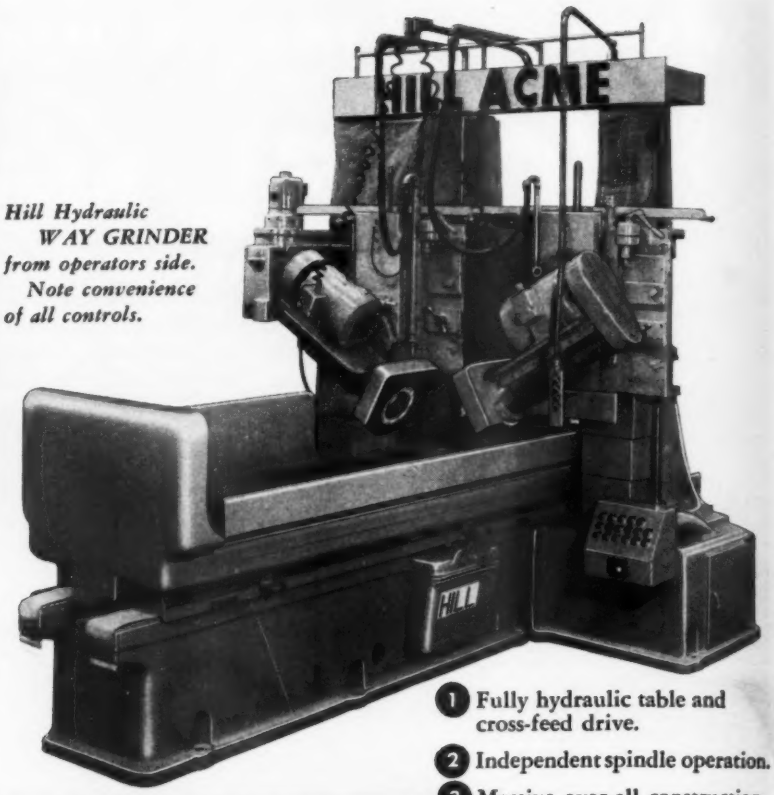
☐ Send full details on the No. 32.
☐ Have your representative call.

Name _____ Title _____
Company _____
Street _____
City _____ State _____

CIRCLE INFORM-A-GRAM KEY NO. 23

HILL double housing WAY GRINDER for accurate grinding of V's, Flats and Angles

Substantial Savings (up to 50%) over previous methods.

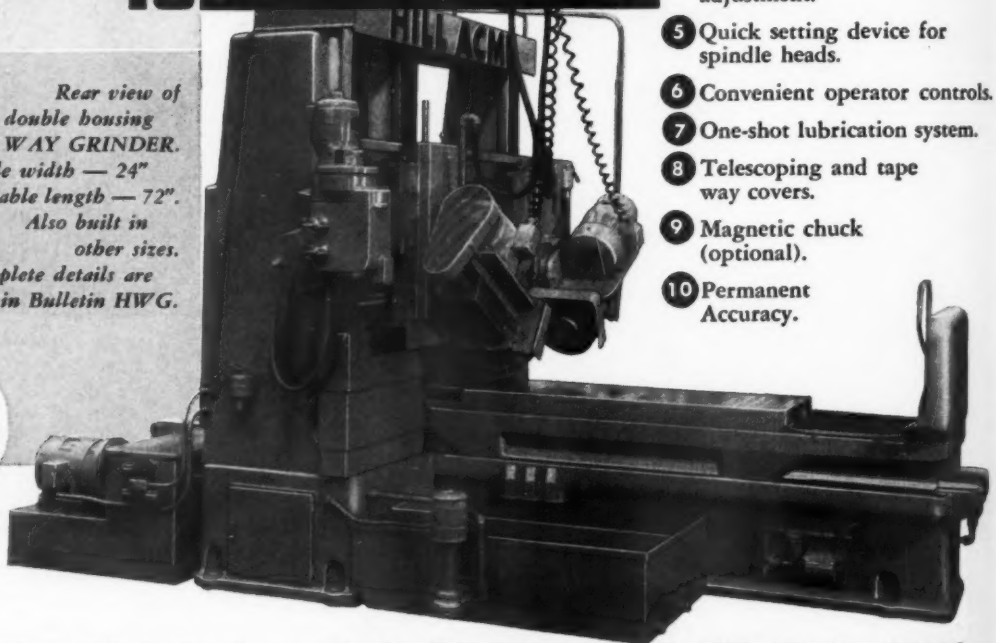


Hill Hydraulic WAY GRINDER from operators side. Note convenience of all controls.

10 points worth considering

1. Fully hydraulic table and cross-feed drive.
2. Independent spindle operation.
3. Massive over-all construction.
4. Rapid traverse and fine feed adjustment.
5. Quick setting device for spindle heads.
6. Convenient operator controls.
7. One-shot lubrication system.
8. Telescoping and tape way covers.
9. Magnetic chuck (optional).
10. Permanent Accuracy.

Rear view of HILL double housing WAY GRINDER. Table width — 24" Table length — 72". Also built in other sizes. Complete details are given in Bulletin HWG.



HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

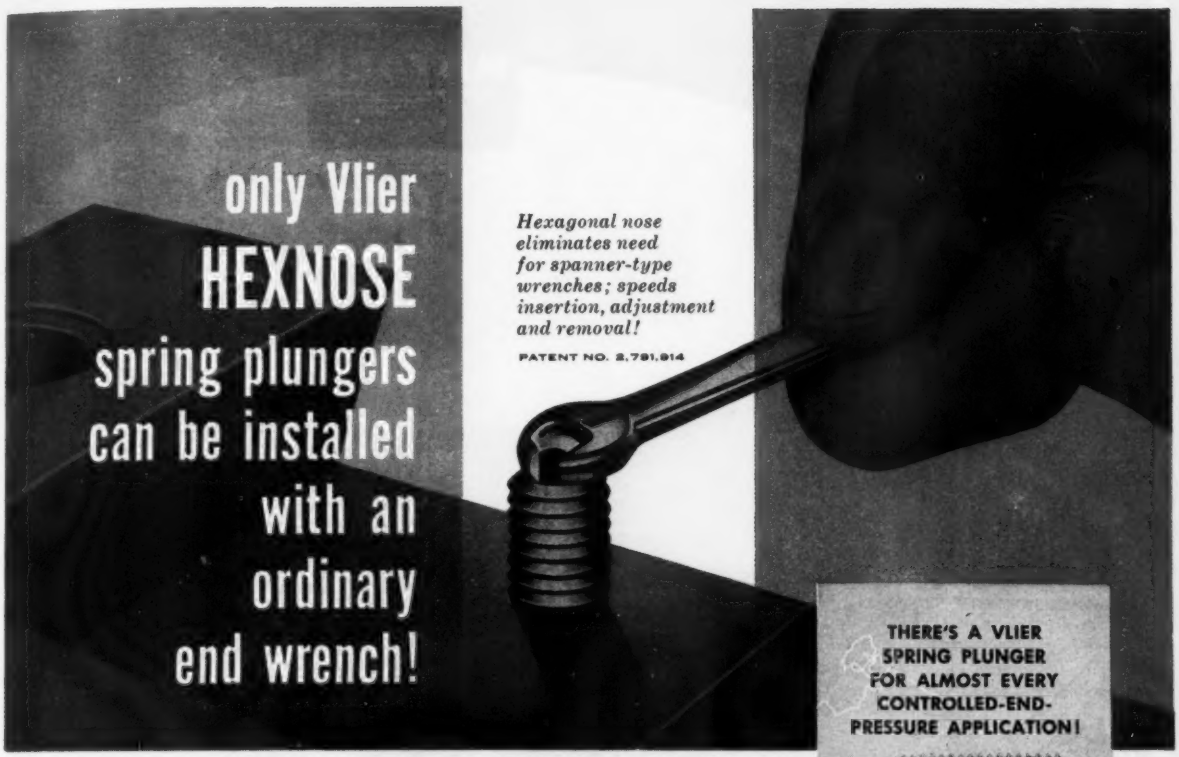
"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

CIRCLE INFORM-A-GRAM KEY NO. 24

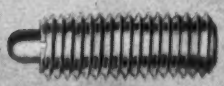
only Vlier HEXNOSE spring plungers can be installed with an ordinary end wrench!

Hexagonal nose eliminates need for spanner-type wrenches; speeds insertion, adjustment and removal!

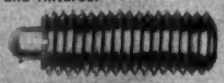
PATENT NO. 2,791,914



THERE'S A VLIER SPRING PLUNGER FOR ALMOST EVERY CONTROLLED-END-PRESSURE APPLICATION!



Standard
Primarily used in ordinary jigs and fixtures.



Silvernose
Light end pressure for repetitive die applications.

Plastic Nose
For use with aluminum, brass and other soft materials.

Hexnose
For greater ease in installing, adjusting and removing.

Whatever your spring plunger application—tooling or original equipment—you'll like the ease and speed with which Vlier Hexnose Spring Plungers can be installed.

No more hunting for clumsy-to-use spanner-type wrenches or special screw drivers—any ordinary end, socket or crescent-type wrench will do the job quickly and easily.

Since the plunger nose is always easily accessible, the Hexnose really pays off where periodic adjustments must be made. Hardening both body and plunger assures body life. Available in both standard and light end pressure models; 11 sizes.

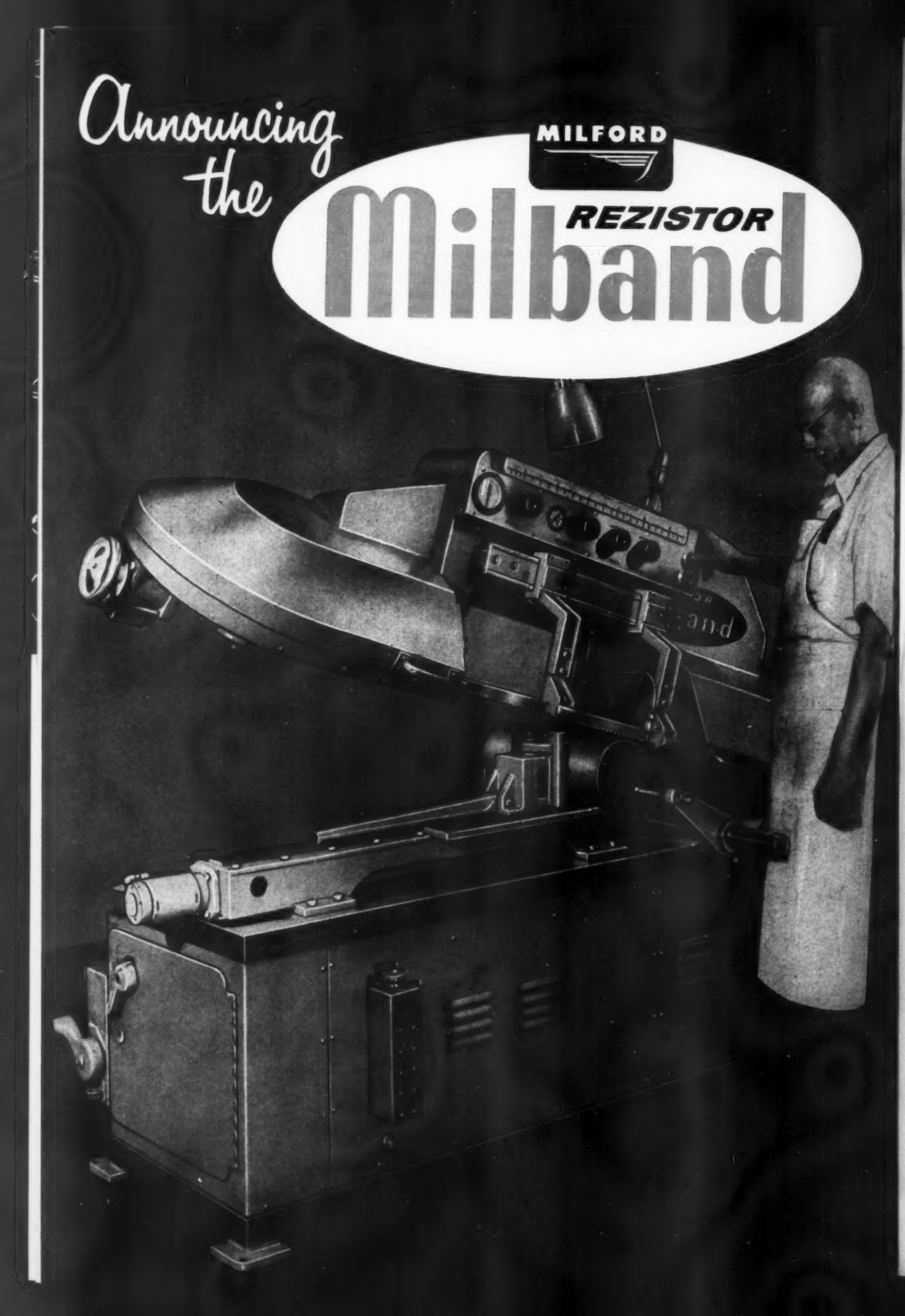
Same sturdy construction as other Vlier spring plungers

1. Large bearing surface overcomes binding, assures perfect alignment of the plunger at any extension.
2. Concentricity between plunger axis and body diameter held to .0015" T.I.P.R.
3. Rust-proof finish and National Coarse Class 2A threads prevent freezing in threaded hole.
4. Plunger end telescopes completely within body. Case-hardening assures extreme wear resistance. Ductile core overcomes brittleness and hazards of fracturing under impact, common with hardened, high carbon steels.
5. Spring pressures are accurate, uniform and dependable.
6. Accurately radiused nose speeds loading and unloading of jigs and fixtures.

Send for your 1957 Vlier catalog.

VLIER ENGINEERING INCORPORATED

CIRCLE INFORM-A-GRAM KEY NO. 25


Announcing the
MILFORD
REZISTOR
Milband

...the NEW Band Saw Machine that Meets Modern Cut-Off Requirements

The all-new MILFORD REZISTOR MILBAND was specifically designed to do a job that no conventional band saw machine can handle . . . utilizing and delivering the full potential cutting capacity of the MILFORD REZISTOR High Speed Steel Band Saw Blade!

The MILBAND is a rugged, heavy-duty machine designed and built for the fast blade speed and heavy feeds of which the REZISTOR Band Saw Blade is capable. A very wide range of variable blade speeds (40 to 360 fpm) provides the right setting for every metal. New hydraulic blade feed automatically compensates for greater blade resistance when cutting larger cross sections. Optional automatic indexing bar feed attachment provides fully-automatic operation, insuring maximum output at lowest cost.

Ideal for high-output cut-off sawing—even where stainless steel, super metals and other tough-to-machine alloys are involved—this blade-and-machine team now brings you faster and more *accurate* cutting . . . and important savings in chip loss compared with conventional cut-off methods.

The MILBAND and MILFORD REZISTOR . . .

the Machine and Blade Team for High Speed Production.

WRITE NOW FOR COMPLETE INFORMATION

SAW & BAND SAW BLADES • STOCK • HACK • HOLE SAWS • GROUND FLAT

MILFORD

THE HENRY G. THOMPSON & SON CO.

Saw Blade Specialists for Over 80 Years

NEW HAVEN 5, CONNECTICUT

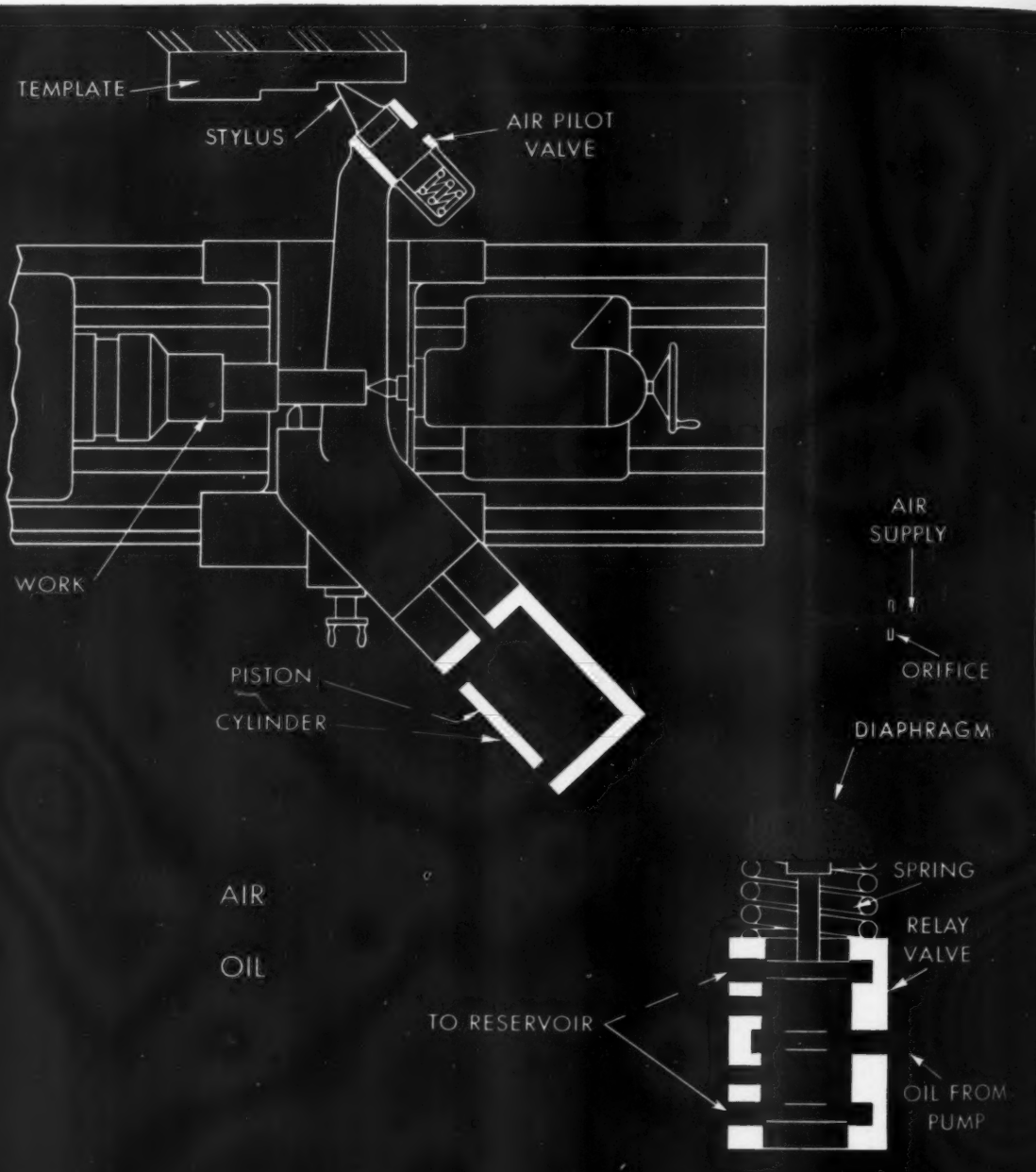
SEE THE MILBAND

. . . at BOOTH 1545, NATIONAL METAL EXPOSITION, CHICAGO

CIRCLE INFORM-A-GRAM KEY NO. 27

It's a breeze

to cut costs, boost production and quality with the Monarch "Air-Gage Tracer"



The above diagrammatic drawing shows the simplicity of Monarch "Air-Gage Tracer" operation. As the design deals with both air and oil in constant motion, reaction in the power cylinder is within a few thousandths of a second after the tracer changes position. Result —super-accuracy piece after piece, job after job.

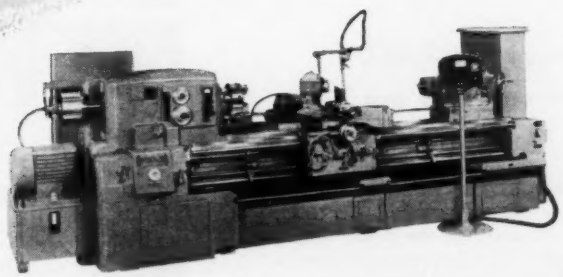
No lathe development in recent years has equaled template controlled turning for substantial cost reduction. Its advantages, when performed the Monarch "Air-Gage Tracer" way, are many. This duplicating method:

- Always outproduces a manually operated machine; in some instances as much as 8 to 10 times.
- Provides automatic sizing, thereby reducing spoiled work to the absolute minimum.
- Imparts a smooth, stepless finish on any combination of cuts, whether turning, facing or boring.
- Often halves amount of stock left for grinding; sometimes eliminates grinding and polishing operations.
- On most work, reproduces accuracy of template within ±.001".
- Eliminates the need for expensive form tools and the cost of multiple tool setups.
- Allows a complete setup change in as little as 15 to 20 minutes; tool change in 1 minute.

Write for complete descriptive booklet No. 2608. It contains dozens of typical job examples . . . ***The Monarch Machine Tool Company, Sidney, Ohio.***

Exclusive Features of the "Air-Gage Tracer"

1. The only lathe duplicator which utilizes the combination of air-hydraulic control. That's the secret of its super-accuracy.
2. The air circuit is an open loop servo system which provides air-gaging and multiplies both force and motion.
3. It's the simplest and most trouble-free of all lathe duplicating methods. Tracer head maintenance is never a costly problem.
4. Stylus pressure against template is only 5 to 6 ounces, practically eliminating template wear.
5. Either a flat or a round template may be used. Excepting on very small lot, non-repetitive runs, the flat template has many advantages. Never is it necessary to use a large, bulky round template so that it can be indexed periodically due to excessive wear from high stylus pressure.
6. Available both in a rigid and swiveling type, the latter of which may be used at any setting between 45° and 90°. Universal nature of swiveling type a "must" for top production on many complex facing and boring operations.
7. The only lathe duplicator offered optionally with full automatic cycling and potentiometer feed control.
8. Backed by almost 30 years' experience in the field of tracer controlled turning. Thousands of "Air-Gage Tracer" lathes attest to its acceptance by industry everywhere.



Above is a Monarch Series 62 Preselector Dyna-Shift Lathe with "Air-Gage Tracer" and auto cycle unit. This duplicating means may be factory applied to all lathes in the Monarch line. They may be converted to conventional manual operation merely by the flick of one lever. The "Air-Gage Tracer" is also the heart of such Monarch production lathes as the Mona-Matic, Hydra-Slide and Right Angle.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

CIRCLE INFORM-A-GRAM KEY NO. 29

Up to 40% higher tightening torques keep a

—and only the combination of an UNBRAKO screw

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

The High-Torque UNBRAKO socket set screw is made to withstand the highest tightening torques ever used to seat a set screw—up to 40% higher than an ordinary set screw. But to take full advantage of this UNBRAKO feature you must have a key that can apply the force required to seat it without damaging the screw or snapping the key. The High-Titan UNBRAKO hex key is designed specifically to set a High-Torque UNBRAKO so that you can be assured of full *high-torque* performance every time.

Here's why a High-Torque UNBRAKO can be seated tighter—and stay put

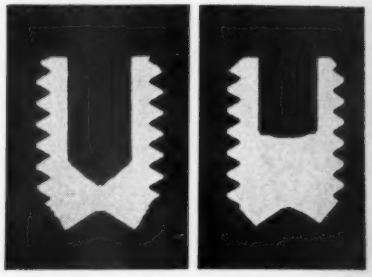
UNBRAKO SET SCREW

It has fully formed threads that make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see in this illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010 in. below root diameter. Screws with cut or ground threads lose thread form at root diameter.

UNBRAKO SET SCREW

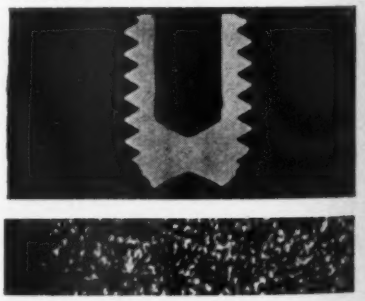
The High-Torque UNBRAKO has a radius in the socket corners. This eliminates the sharp corners where cracks start. It also distributes the stresses developed when tightening torques are applied. Ordinary socket screws have sharp corners which often crack when tightened even at lower torques than those recommended for UNBRAKO.

UNBRAKO SET SCREW **ORDINARY SET SCREW**



The High-Torque UNBRAKO has a deeper socket, which gives you more purchase with the wrench. Since more wrench can be put into the UNBRAKO socket, you can set the screw much tighter. And you won't ream the socket or round the corners of the wrench.

UNBRAKO SET SCREW

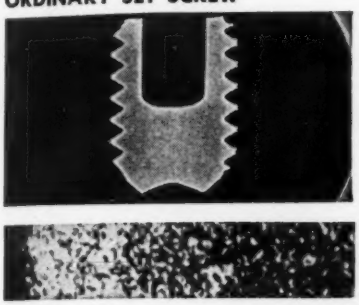


The High-Torque UNBRAKO is properly heat treated, kept clean. Its grain structure is uniform. It is free of decarburization. There's no danger of stripping the threads or shearing the point when tightening

High-Torque UNBRAKO socket set screw tight

and key assures full *high-torque* performance

ORDINARY SET SCREW



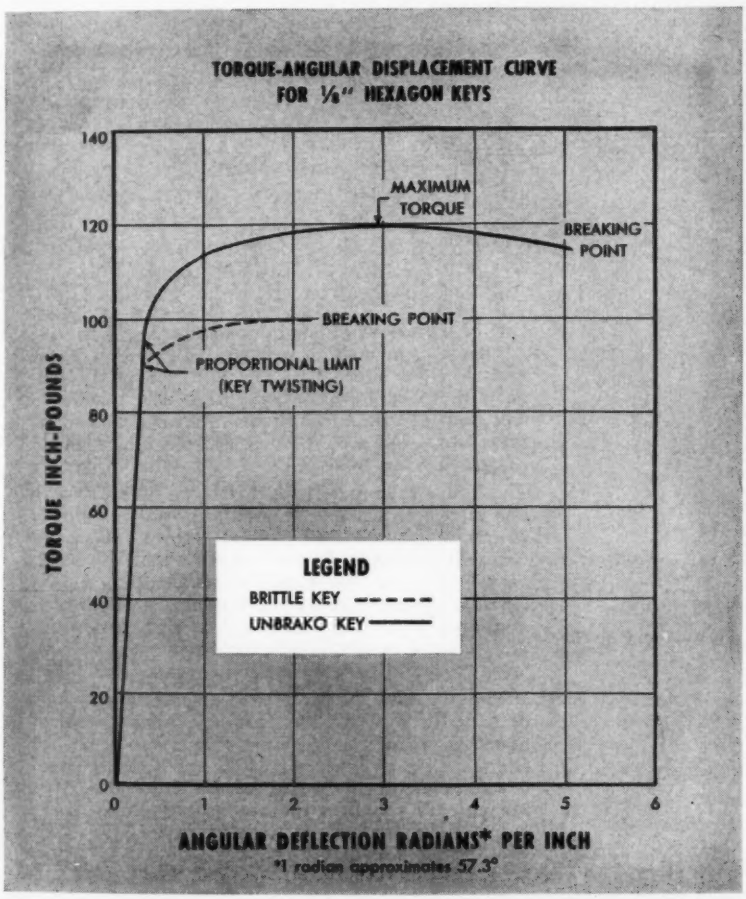
torques are applied. The ordinary screw is suffering from an overdose of decarburization; socket walls, threads and point are full of the telltale white spots that identify it.

And here's why an UNBRAKO High-Titan hex key can be used to apply far more tightening torque to a High-Torque UNBRAKO socket set screw than is needed without damaging either the screw or the key.

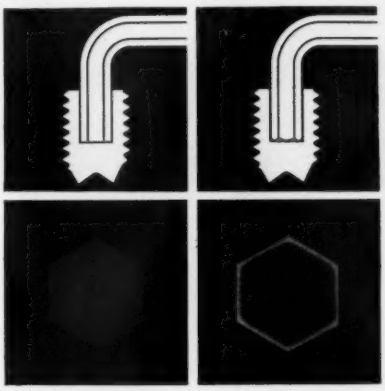
The High-Titan UNBRAKO is not an ordinary hex key. It is a precision internal wrenching tool with high ductility, specially designed to assure full high-torque performance. It is made of special alloy steel bar stock, inspected magnetically and chemically to make sure that the material is flawless and of the specified properties.

Its sides are flat and parallel. The corners, which exert torque on the inner walls of the socket, are sharp and tough. The bend is strong.

The High-Titan UNBRAKO is accurately sized across the flats and across the corners to insure snug fit and full wall contact. It won't ream or wear an UNBRAKO socket. The square cut end engages the full depth of the socket for greater tightening power. It gives you up to 25% more wrench engagement than a key with a chamfered end.



UNBRAKO KEY **CHAMFERED END KEY**



The High-Titan UNBRAKO hex key is heat treated in modern atmosphere-controlled furnaces. The surface is casehardened without decarburization. The extra hard surface gives the key longer life. And it retains its dimensional accuracy, is tougher and more ductile than ordinary keys. This torque-angular displacement curve for 1/8 in. hexagon keys distinguishes a High-Titan UNBRAKO from an ordinary key. The High-Titan UNBRAKO has a higher yield point and a higher breaking point—you can exert a much higher torque with it without snapping the key.

Be sure you get the full high-torque performance offered only by the combination of a High-Torque UNBRAKO socket set screw and a High-Titan UNBRAKO hex key. Both products are stocked by authorized industrial distributors. Ask the one nearest you for complete information. Or write STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

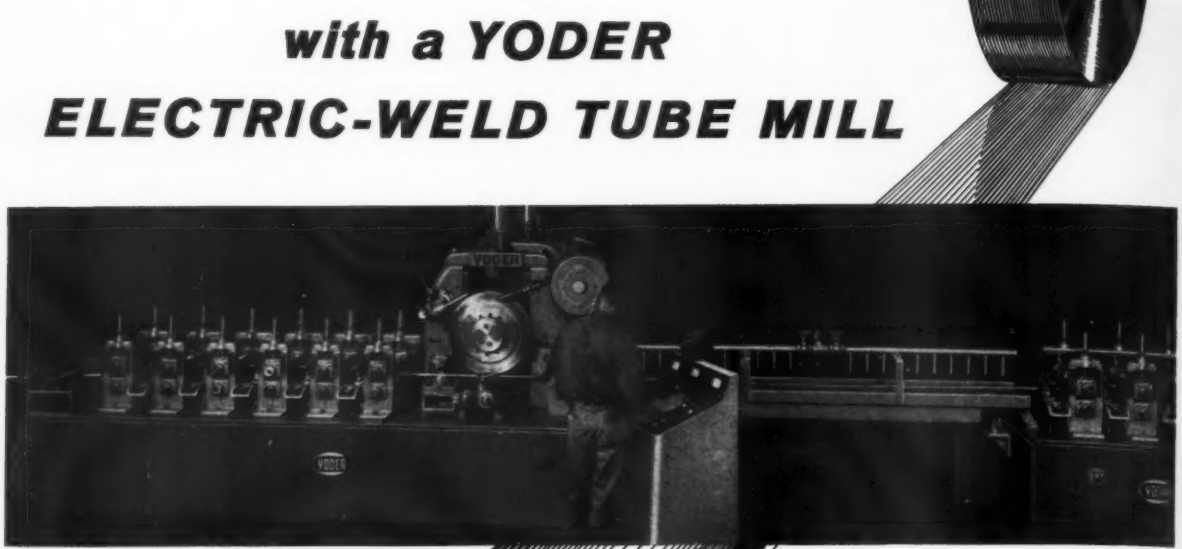
We also manufacture precision titanium fasteners. Write for free booklet.

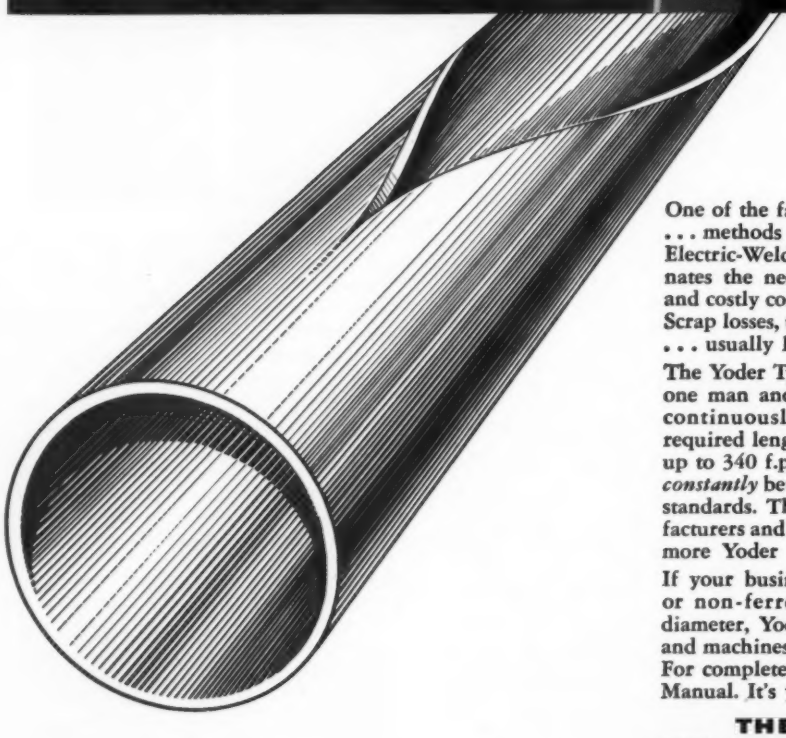
Unbrako Socket Screw Division **SPS** **Jenkintown, Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Cooper Precision Products • Standco Canada, Ltd. • Unbrako Socket Screw Co., Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 31

from cold strip to finished tubing IN SECONDS! with a YODER ELECTRIC-WELD TUBE MILL





One of the fastest . . . and one of the least expensive . . . methods of making steel tubing is with a Yoder Electric-Weld Tube Mill. The Yoder method eliminates the need for time-consuming heat treatments and costly conditioning furnaces for most tube needs. Scrap losses, too, are far lower than any other method . . . usually less than 2%.

The Yoder Type-M Mill shown above is operated by one man and a helper. Coiled strip on this mill is continuously cold-roll formed, welded and cut to required lengths in a matter of seconds . . . at speeds up to 340 f.p.m. The quality of the resulting tube is *constantly* better than the requirements of commercial standards. This is one of many reasons why manufacturers and users of tubing the world over are using more Yoder mills than all other makes combined.

If your business requires pipe and tubing, ferrous or non-ferrous, in sizes from ¼-inch to 26-inch diameter, Yoder can supply the engineering service and machines to produce it faster and better for less! For complete details, write for the Yoder Tube Mill Manual. It's yours for the asking.

THE YODER COMPANY
5501 Walworth Avenue • Cleveland 2, Ohio

ENGINEERING **YODER** MANUFACTURING

PIPE AND TUBE MILLS (ferrous or non-ferrous)
COLD ROLL FORMING MACHINES
ROTARY SLITTING LINES

CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Month's Talk from page 22

skilled labor supply, in a word, is training — training for each worker to the full extent of his capabilities. This means better schools for the young, improved opportunities for the older worker, the woman worker, and the worker from minority groups.

It means a concentration upon the individual such as we have never before achieved. It means the final abandonment of policies where barriers set up against the Negro and the older worker, which condone the pirating of skilled workers, which have considered workers in the mass and not as individuals.

This is what the new technology offers us: the chance not only to make good on America's economic promise, but also to give full substance to our ideas about individual dignity. Through two centuries of industrial change and social progress we have been moving toward this goal. Now that we have it within our grasp, I am confident that we will have the patience, the good will and the good sense to capitalize upon our opportunity.

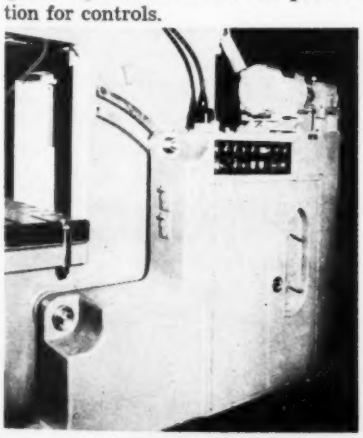
We will not fail to do so, so long as we bear in mind that all of our possibilities lie with the individual — and many of our difficulties stem from the misuse of him. **end**

CONTROLS ARE BUILT INTO LEGS

Moisture-proof cabinets cast within press legs provide space for electrical, air, and lubrication controls. Direct operator controls can be mounted in a recessed panel on the outside of the leg.

The legs are supplied as extra equipment for certain Minster open back, inclinable, and gap presses of 22-ton capacity or more.

The "built-in" compactness allows quick adjustment as well as protection for controls.

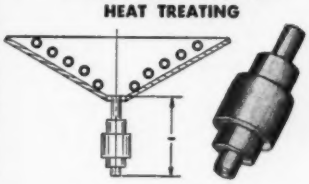


The Lepel line of induction heating equipment represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating.

If you are interested in induction heating you are invited to send samples of the work with specifications. Our engineers will process and return the completed job with full data and recommendations without any cost or obligations.

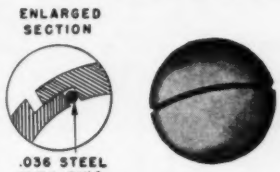
TYPICAL INDUCTION HEATING APPLICATIONS

TEMPERING FOR CUSTOM HEAT TREATING



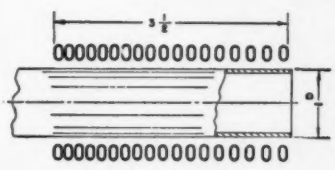
Selected areas of hardened steel parts may be tempered for fabrication or service requirements. Concentrator type coil permits high power density in restricted area thus minimizing heating time and permitting marked variation in properties in adjacent sections.

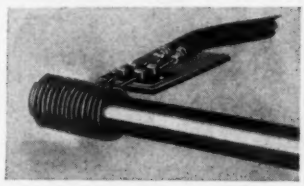
WIRE RING JOINS PLASTIC PARTS



High frequency induction heats wire ring which in turn heats plastic wall, providing sufficient plasticity to cause flow and bonding upon application of pressure. Metal to plastic seals are similarly performed.

ANNEALING ALUMINUM FURNITURE TUBING

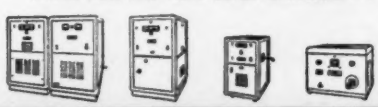




Selective annealing of aluminum furniture tubing permits bending where required without loss of strength in adjacent portions of tube. Brass or steel tubing is also being selectively annealed.

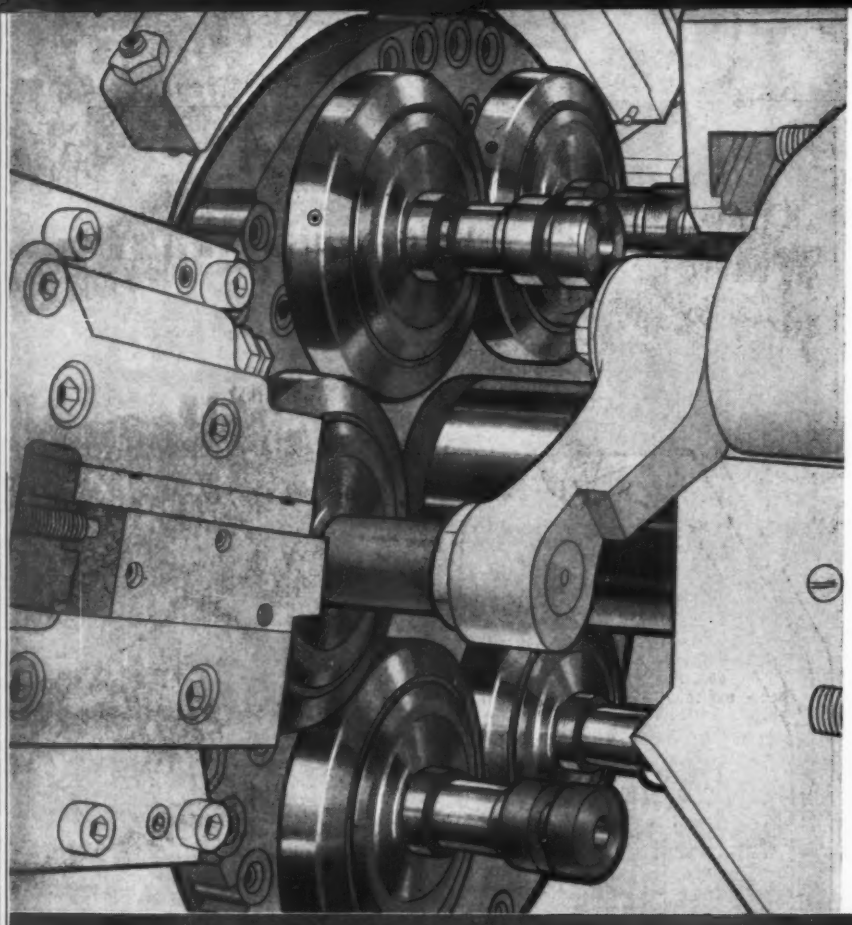
Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.



All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

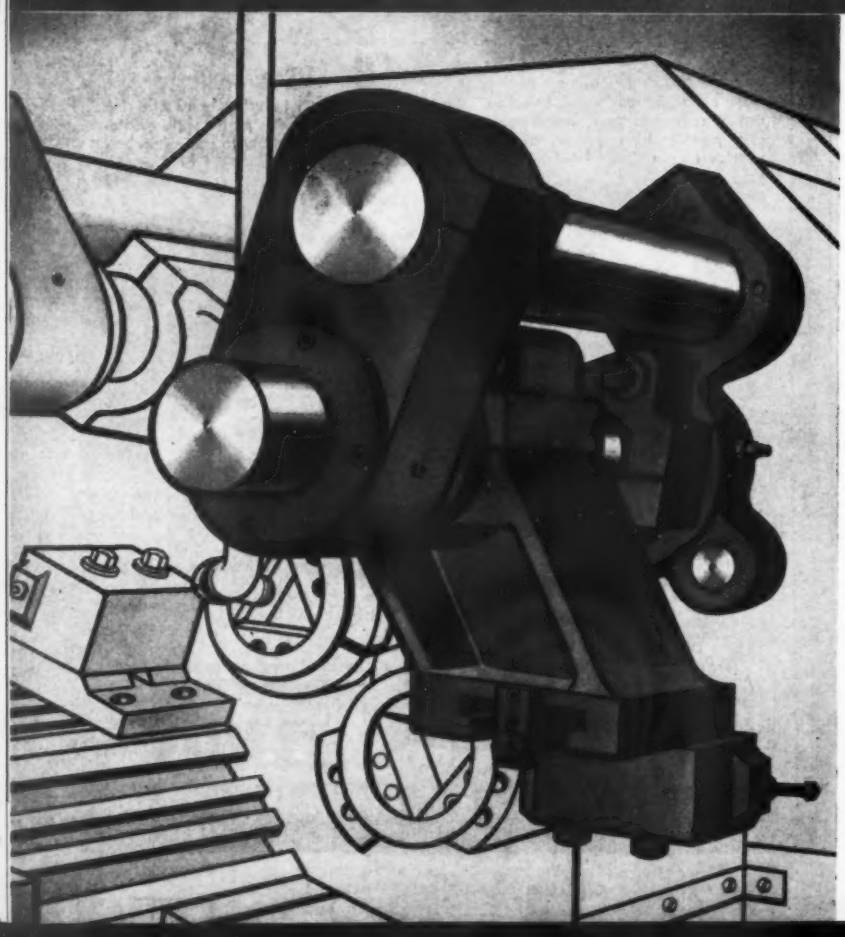
LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.



Look at New Britain's

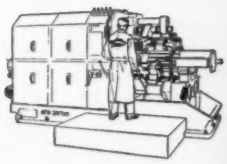
new automatic bar machines

The widest range of spindle speeds among machines of comparable capacity and accuracy.

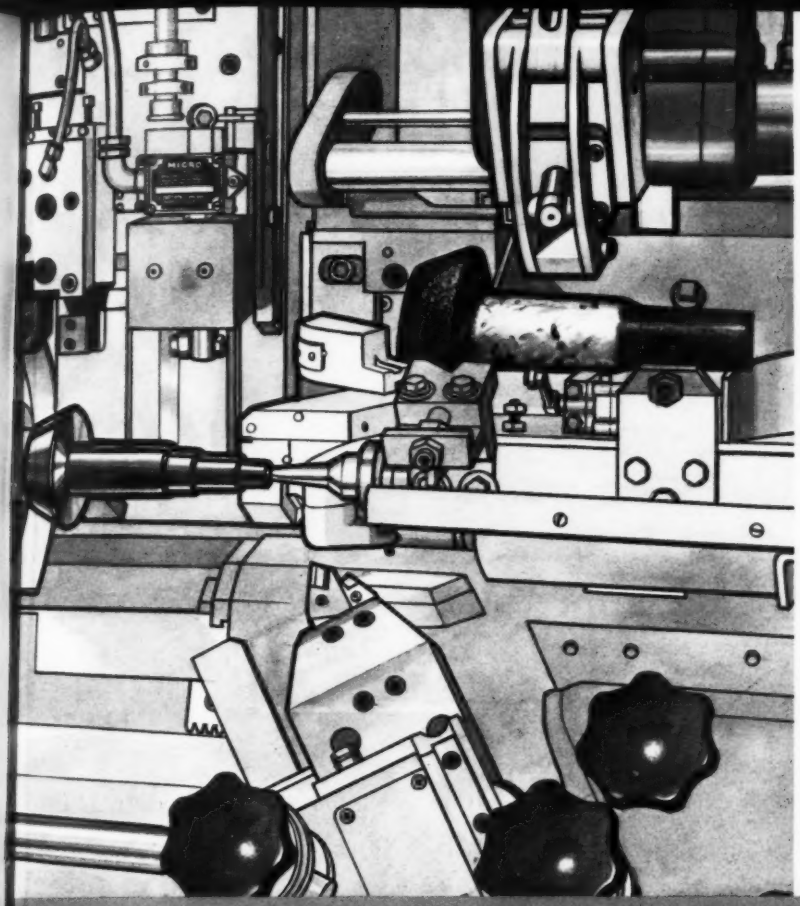


Look at New Britain's

exclusive chucker arms

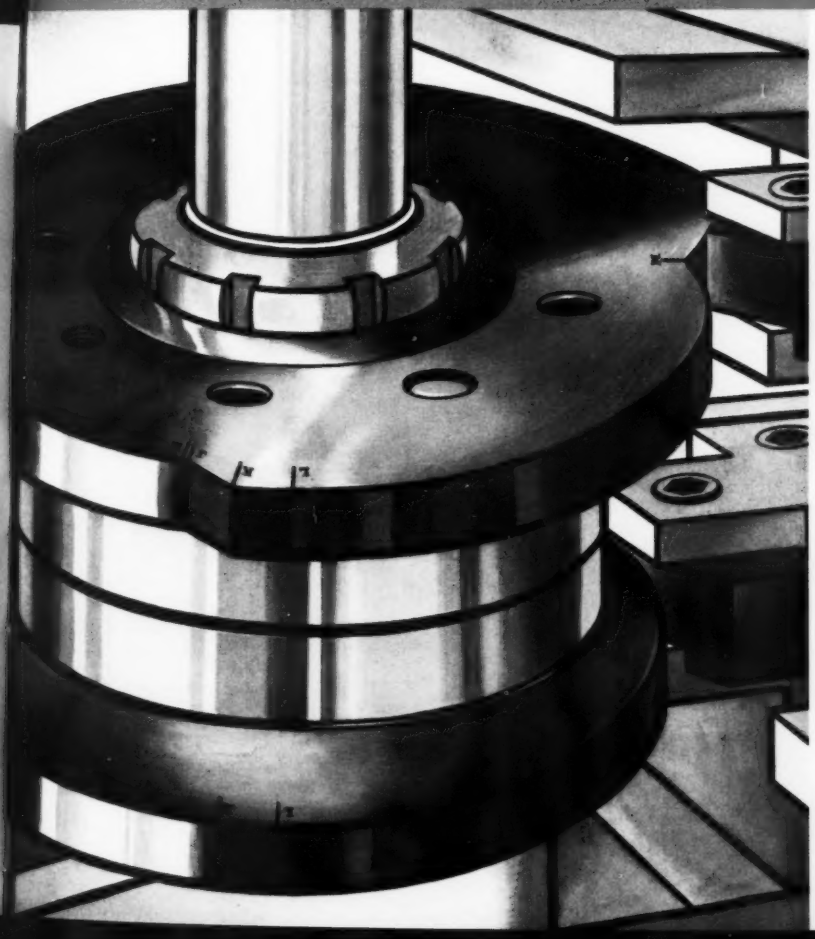


All the ruggedness of a cross slide, but with two-way motion for cutting O.D.'s, I.D.'s, tapers and radii and for recess boring, in addition to facing cuts. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



Look at
Automatic Loading on
New Britain +GF+

This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.

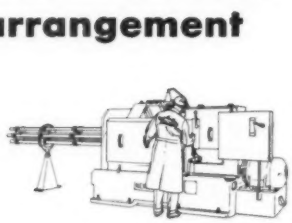


Look at New Britain's
cam-controlled boring machine

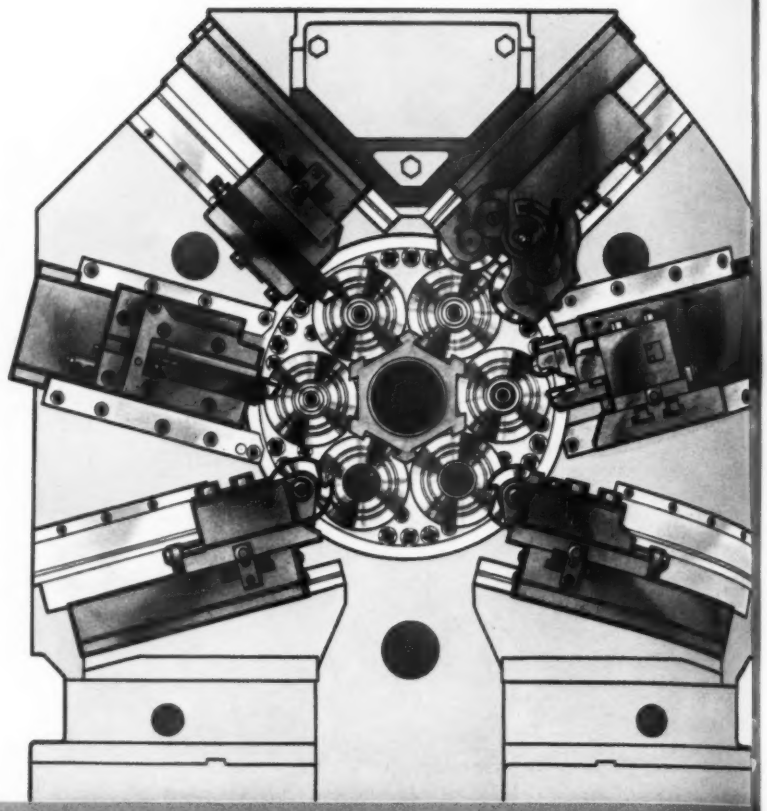
When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

Look at New Britain's

new cross slide arrangement



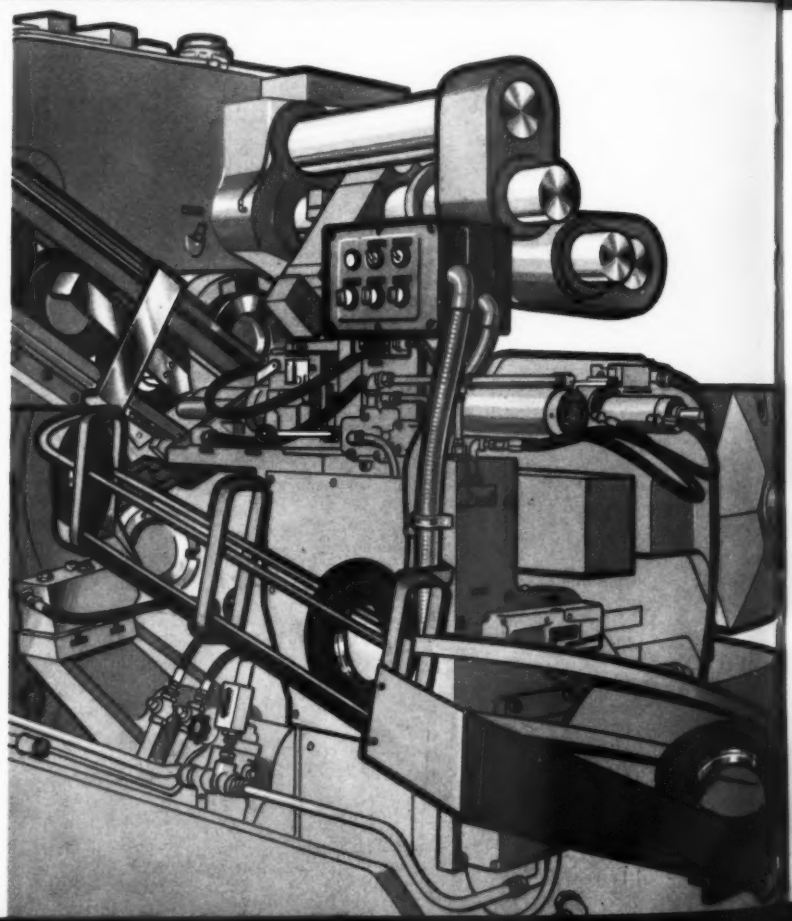
Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.



Look at New Britain's

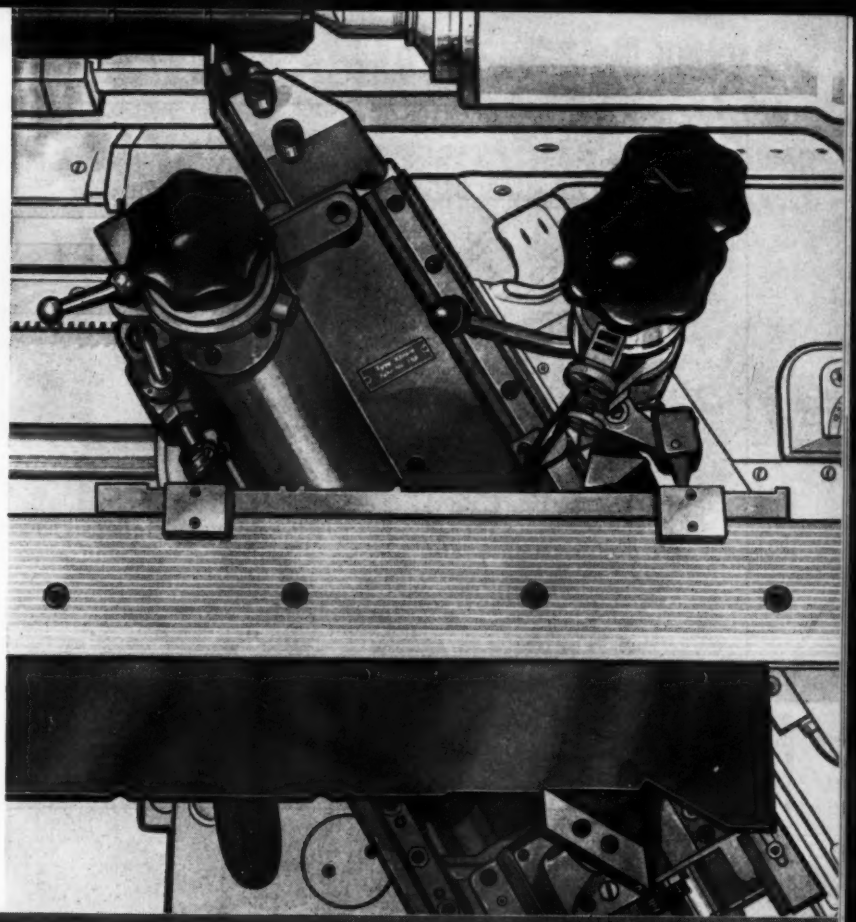
open-end chucker design

Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



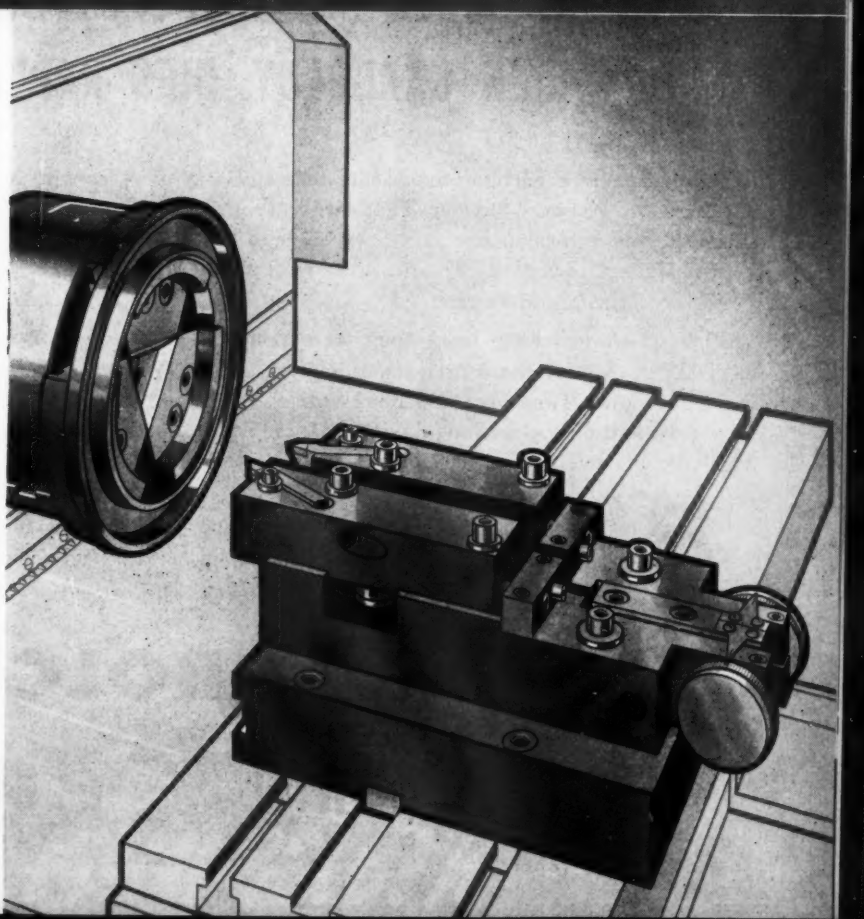
Look at
Single Point Tooling on
New Britain +GF+

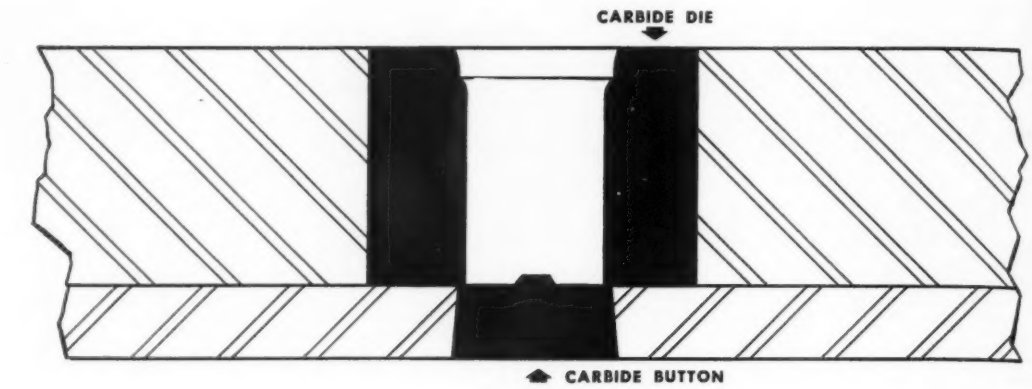
Outproduces gang tooling setups by reducing tool change time practically to zero, and by cutting at maximum speeds and feeds for tool efficiency.



Look at New Britain's
simple approach to problem pieces

Low cost per piece is inherent in New Britain Precision Boring Machines because of their simplicity, versatility, speed, repetitive accuracy and inexpensive tooling. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.





Cross section of Carboloy carbide-equipped die used by Federal Drop Forge Co. The die cold-extrudes SAE 1010 steel blank (A) into ball seat (B) for automotive steering mechanism.

Cold-extruding 1010 steel ball seats . . .

AN EXTRA DAY'S OUTPUT EVERY 3 DAYS WHEN CARBOLOY® DIES REPLACED STEEL

Carboloy cemented carbides are harder than steel — and far more resistant to wear. That's why carbide-equipped cold-extrusion dies save an average of 2½ hours of press downtime *per shift* at Federal Drop Forge Co., Lansing, Michigan.

When steel dies were used, they were polished each shift . . . and the button (see diagram) had to be reground. Time lost: 2½ hours per shift, or the equivalent of one working day every three days. Steel die life averaged 25,000 pieces; steel buttons produced about 15,000 pieces per grind.

Now that Carboloy carbide dies and buttons are used, only occasional polishing is required. One die has produced almost 1 million extrusions in 2½ years with only .0003" wear . . . and carbide button life averages 2 million pieces.

In addition to longer die life, a costly centerless grinding operation was eliminated because, with carbide dies, specified tolerances are held from beginning to end of the run. And, the surface finish after extrusion is better than previous centerless-ground finish.

The unique properties of Carboloy cemented carbides can be used just as effectively on drawing, forming, or blanking operations. Check with your diemaker for more information. Or write: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Road., Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

CIRCLE INFORM-A-GRAM KEY NO. 38

Northwestern TOGGLE-SHOE CLAMPS

THREE NEW SOCKET TYPES! KNURLED SHAFT • KNURLED HEAD • HAND KNOB

ALL TYPES ARE INTERCHANGEABLE WITH *"SNAP ON-SNAP OFF"* ROUND OR V-PADS

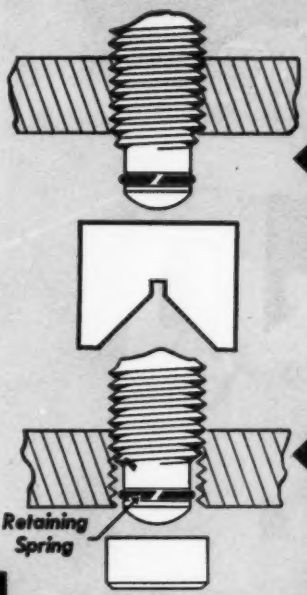
PATENT APPLIED FOR

SIZES — ¼-20 to ⅝-11 **LENGTHS — 1" up to 5¼"**

There is a dealer near you that stocks Northwestern Tools—Write for information.

Simple Quick Assembly

• SNAP ON SNAP OFF



Retaining Spring

10° ADJUSTMENT in all directions

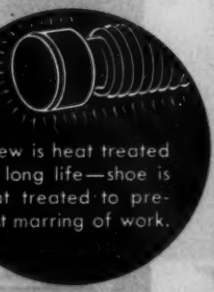
Retaining spring holds shoe in place yet allows a full 10° adjustment in all directions.

NO INTERFERENCE

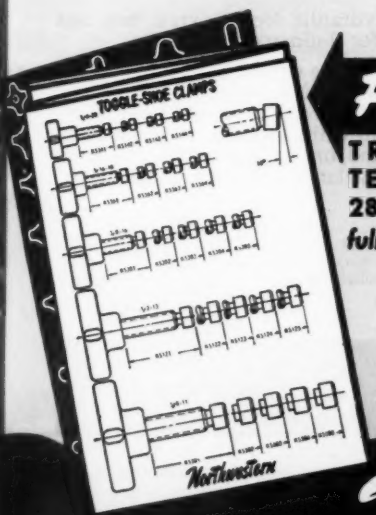
Shoe only 1/16 larger than bolt

Short shoe design requires a minimum distance between fixture and the work.

HEAT TREATED for max. toughness



Screw is heat treated for long life—shoe is heat treated to prevent marring of work.



Free

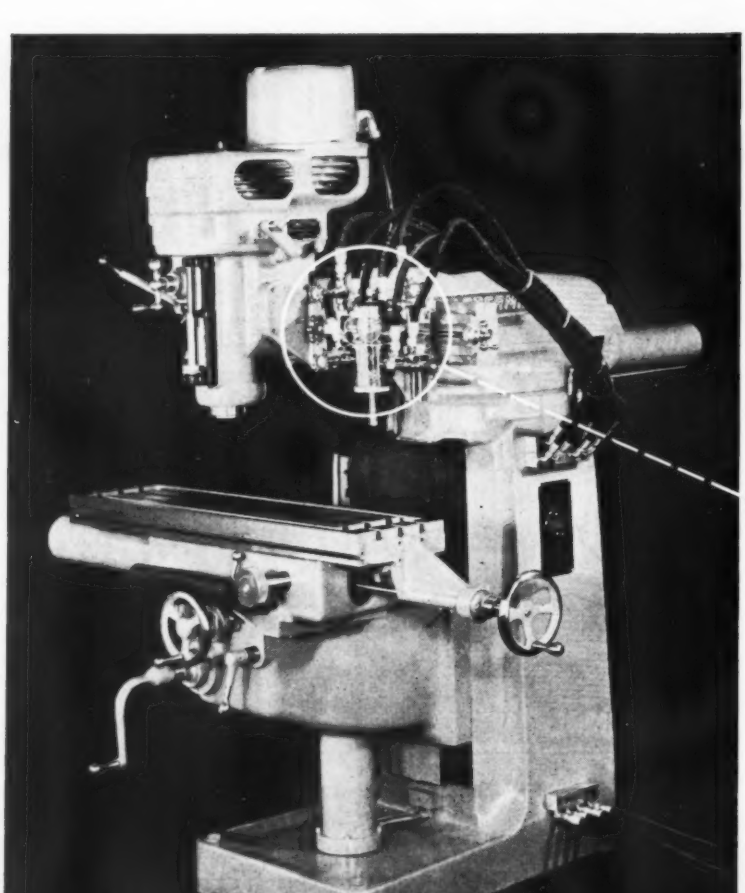
TRACING TEMPLATE 286 ITEMS ***full Scale •••***

CIRCLE INFORM-A-GRAM KEY NO. 39

116 HOLLIER AVE. ***Northwestern*** DAYTON 3, OHIO

Now "Micrometer Accuracy" Applied to Hydraulic Tracer Control

Provides more speed in Production Profiling and Duplicating



Gorton Trace-Master Hydraulic Tracer control is today's best unit for 2- and 3-dimensional duplication, production profiling and work on all types of die forging, die casting, metal stamping, embossing and coining, as well as plastic molds in both ferrous and non-ferrous materials.

GORTON

"TRACE MASTER" Supersensitive Hydraulic Control

This master control valve is manufactured to tolerances which are NEW in the field of hydraulics. Working parts are so delicately ground and lapped that they will operate only with a very fine grade of special oil. *Ordinary hydraulic fluids are wholly unsuitable.*

3 MODELS AVAILABLE

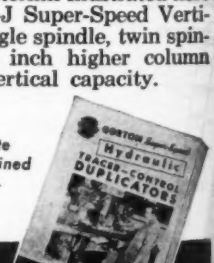
180° Vertical Hydraulic Feed to Knee.

360° Cross Hydraulic Feed to Ram and Longitudinal Hydraulic Feed to Table.

3D Hydraulic feed to knee, ram and table for 3-dimensional work.

The above can be furnished with the Gorton 1-22 Mastermil illustrated here or the Gorton 9-J Super-Speed Vertical Mill with single spindle, twin spindles and/or six inch higher column for additional vertical capacity.

Write for complete information contained in bulletin 2771 – 1211



GORTON

GEORGE GORTON MACHINE CO.

1211 RACINE ST. • RACINE, WISCONSIN

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A7-1002-1P

CIRCLE INFORM-A-GRAM KEY NO. 40

FALCON

KWIKLOK

QUICK CHANGE HOLDERS

with T. I. DRIVE

PAT. NO. 2,612,377

Decidedly New!

OUR—ADAPTERS—Will take SHELL END MILLS, BROWN & SHARPE And MORSE TAPERED SHANK STANDARD DRILLS & REAMERS, STRAIGHT SHANK END MILLS, JACOBS CHUCKS, FLYNN OFFSET BORING HEADS, FALCON T.I. DRIVE STANDARD INTERCHAIN GEABLE COUNTERBORES, SOLID BORING BARS, FLOATING TAP HOLDERS & ETC.

—FALCON—

KWIKLOK-HOLDERS

Are the quickest of the quick.

Made with NATIONAL STANDARD TAPERS, BROWN & SHARPE, MORSE & ETC.

you have waited for...

Just what

—YOU—Can have our latest Brochure just for the asking. It will give you all the PERTINENT ENGINEERING DATA You will want.

WRITE FOR YOUR COPY TODAY

END MILLS • FORM RELIEVED CUTTERS • REAMERS • MILLING CUTTERS SPECIAL TOOLS • MULTIPLE DIAMETER STEPCUTTERS • T. I. DRIVES ON ALL TYPES OF SHANK TOOLS • COUNTERBORES • KWIKLOK QUICK CHANGE TOOL HOLDERS, ADAPTERS AND ETC.

FALCON

Mailing Address: P. O. Box 4605
Mt. Elliott Station, Detroit 34, Mich.

Shipping Address: 20771 Ryan Road

2549

ALL THE **PRODUCTION** YOU'LL *EVER* WANT—

ALL THE **PRECISION** YOU'LL *EVER* NEED

The Hamilton No. 00 Gear Hobbing Machine

Generates spur gears and pinions of plus-precision for assemblies which the world relies upon for accuracy. You will marvel at its *rigidity* and *stamina*, at its quiet efficiency and ease of operation. And you will want it for your own when you apprehend the import of its *important* feature No. 10 (independent selection of feed and indexing). Capacity — .050" to 2" O.D. of the gear blank. Free Bulletin No. 2549 provides full information.

Address: THE HAMILTON TOOL COMPANY
832 SOUTH NINTH STREET
HAMILTON, OHIO, U. S. A.

It's the

Hamilton

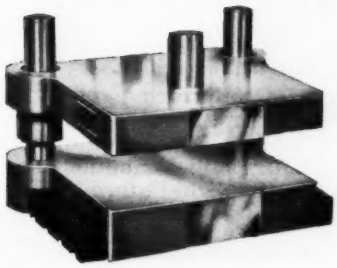
PRECISION SMALL-GEAR HOBBING MACHINE

THESE ARE REPRESENTATIVE USERS OF HAMILTON GEAR HOBBING EQUIPMENT

AiResearch Manufacturing Co. • *Duncan Electric Co.* • Bendix Aviation Corp. • *Victor Adding Machine Co.* • Lear, Co. • *Minneapolis-Honeywell Regulator Co.* • Geophysical Machine Works • *Hughes Aircraft Co.* • Westinghouse Electric Corp. • *Rockwell Meters, Inc.* • Borg Products Division • *Herschede Hall Clock Co.* • U. S. Navy Electronics Laboratory • *Redstone Arsenal* • Smallwood & Son Machine Co. • *Link Aviation, Inc.* • Bell Aircraft • *Schlumberger Well Surveying Corp.* • Douglas Aircraft • *General Mills* • Teletype Corp. • *Elgin National Watch Co.* • U. S. Naval Gun Factory • *Grimes Manufacturing Co.* • Texas Instruments, Inc. • *McDonnell Aircraft Co.* • American Machine & Metals • *Stromberg-Carlson Co.* • Hamilton Standard • *U. S. Gauge Co.*

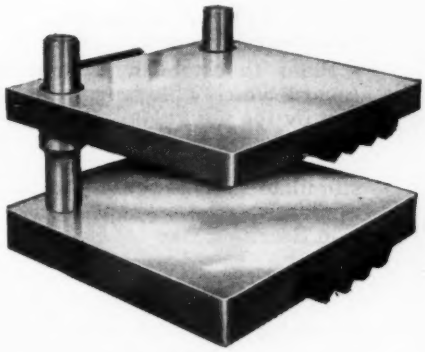
CIRCLE INFORM-A-GRAM KEY NO. 42

HANDLE LARGE AND SMALL DIE SETS SAFER·FASTER·MORE EFFICIENTLY



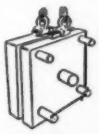
ONLY SUPERIOR *precision all steel* **DIE SETS** *offer exclusive safety and handling features.*

Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment. **In addition, all Superior Die Sets are jig bored to your specifications — result number of sizes practically limitless.** Write for FREE 24 page Catalog on Superior Die Sets and Supplies.

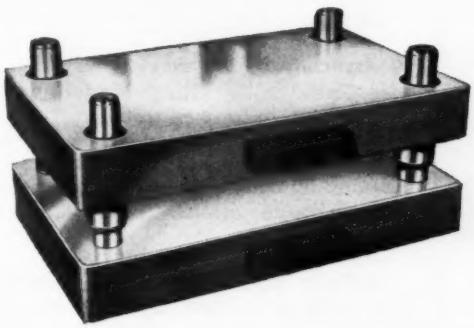


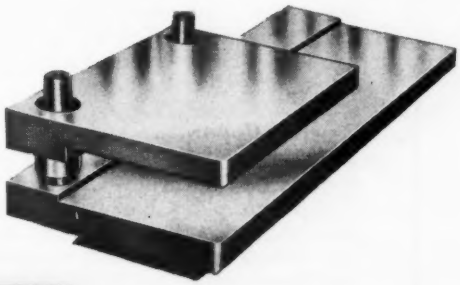
LOCK-JAW LIFTING DEVICE removes the danger of handling large die sets.

SAFETY FLANGE protects fingers by providing roomy gripping space on either side of the die shoe.



E-Z LIFT SLING CHAIN attach to the lock-jaw for immediate lifting.





FOR FAST LOCAL SERVICE CALL THESE EXPERT SUPERIOR REPRESENTATIVES

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Hemlock 6209
Chicago, Ill.
Randolph 6-8871
St. Louis, Mo.
Jeff 5-1223

Dallas, Texas
Riverside 5138
Winter Park, Fla.
4-0464
Minneapolis, Minn.
FR 1-1321
Memphis, Tenn.
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Orange 5-5810
Denver, Colo.
Enterprise 234

Agawan, Mass.
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Cedar 9-1661
Racine, Wis.
Melrose 2-1900

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Milwaukee, Wis.
Mitchell 5-6027

Plainville, Conn.
Sherwood 7-2761

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

MULTI-SLIDE SETS TO YOUR SPECIFICATIONS

CIRCLE INFORM-A-GRAM KEY NO. 43

MANUFACTURING MEMOS

Rights Acquired . . .

• Manufacturing rights for the Futurmill structural milling machine have been acquired by Baldwin-Lima-Hamilton Corporation from Futurmill, Inc. Distribution of the machine, now named the Baldwin-Futurmill, will be retained by Futurmill, Inc.

• Gulton Industries, Inc., has been awarded a license for the production of a Laminagage, a tool for checking platings and coatings on metals, under patent rights held by the General Motors Corporation.

New Award Planned . . .

• Plans to establish an annual Miniaturization Award, which will recognize the greatest contribution by the individual or firm to the advancement of the concept of miniaturization, have been announced. The other purpose of the award is to stimulate further activity within industry toward miniaturization, says the sponsor, Miniature Precision Bearings, Inc.

New Division Formed . . .

• To help the customer by advancing epoxy resin technology, a new division of Epoxy Resin Formulators has been organized in The Society of The Plastics Industry, Inc. This division will cover the electrical, tooling, and adhesives fields. It will assemble and disseminate information on epoxy compounds and advance the applications and uses of these materials.

Association Formed . . .

• The Welded Ring Manufacturers' Association has been organized to better fulfill the requests of code and specification writing bodies for industry-wide acceptance of new and improved specifications for rings, and to assist in the formulation of such specifications.

ASA Gives Awards . . .

• Two professors were awarded the highest awards presented annually by the American Society for Metals. The Gold Medal and senior award went to Dr. John Chipman, head of the Metallurgical Department, MIT, for his research and contributions in the field of slag control, oxidation and deoxidation, and high temperature chemistry. Dr. Tokushicki Mishima, Professor Emeritus, University of Tokyo, was awarded the Albert Sauveur Achievement Award for his work with strong permanent magnets.

Receives Honor . . .

• Ralph D. Webb, head of the instrument department of Union Carbide Chemical Company's South Charleston plant has been elected to Honorary Membership in the Instrument Society of America. The Honor recognizes an individual's outstanding contributions to instrumentation and automatic control.

Irving Danielson, vice president of Chicago Wheel and Manufacturing Co. was recently honored for his 60 years of continuous service to the industry. He was presented with a plaque from the Grinding Wheel Institute.

◆

Keuffel & Esser Co. engineering supply manufacturers, marked its 90th anniversary recently.

◆

Continental Tooling Service, Inc. has changed its name to Continental Technical Service, Inc. The firm handles in-plant engineering assignments relating to product development, designing, production, etc.

◆

Because of the demand for machining work, in addition to its products, The Ohio Piston Co. has changed its name to Ohio Piston & Machining Co.

◆

The purchase of the assets of Pippin Construction Equipment, Inc. by the Cone Automation Machine Co., Inc., has been made known. The Pippin Construction Equipment concern will be called The Conomatic-Pippin Division.

◆

The International Basic Economy Corp. of New York has purchased The Bellows Co. of Akron, O., and its affiliated companies and divisions. Bellows will now operate as a division of IBEC.

◆

The Federal Machine and Welder Co. has acquired a controlling interest in Berkeley-Davis, Inc. of Danville, Ill.

◆

Acquisition of a major interest in M.P.J. Gauge & Tool Co., Ltd., Birmingham, England, by The Sheffield Corp., has been announced. The English concern produces special high precision fixed gaging equipment and dial indicator instruments.

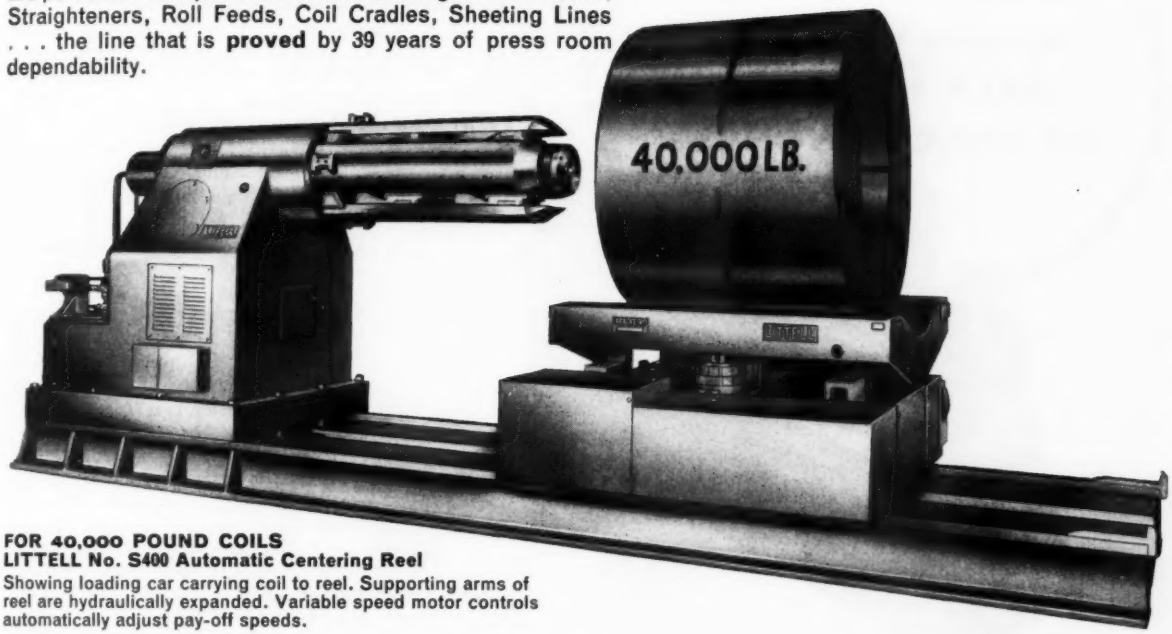
◆

Precision cylindrical grinder manufacturers, Landis Tool Co., has opened a district sales office in Centerville, O., to serve Southern Ohio and northern Kentucky areas.

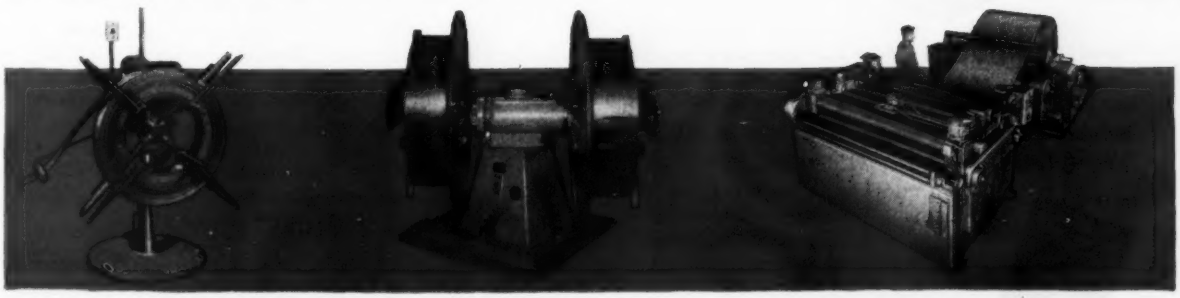
THE LITTELL LINE

INCLUDES REELS FOR 100 LB. TO 40,000 LB. COILS

Your Littell Reel is easy to load. It holds the stock secure, and unreels it smoothly, with controlled action. You can depend on accurate pay-off to automatic feeding equipment, or to press, shear or slitter. For Littell Reels are part of the complete Littell coil handling line . . . Hooks, Straighteners, Roll Feeds, Coil Cradles, Sheeting Lines . . . the line that is **proved** by 39 years of press room dependability.



FOR 40,000 POUND COILS
LITTELL No. S400 Automatic Centering Reel
Showing loading car carrying coil to reel. Supporting arms of reel are hydraulically expanded. Variable speed motor controls automatically adjust pay-off speeds.



FOR 100 TO 1000 LB. COILS
LITTELL No. 3-G and 5-G
These smooth-running, ball bearing, Automatic Centering Reels uncoil stock or wind scrap. Reversible motor.

FOR 2500 POUND COILS
LITTELL No. 25-12 Double Plain Brake Reel
Keeps one coil in reserve as it unreels stock. Easily swivelled to lock the reserve coil in unreeling position.

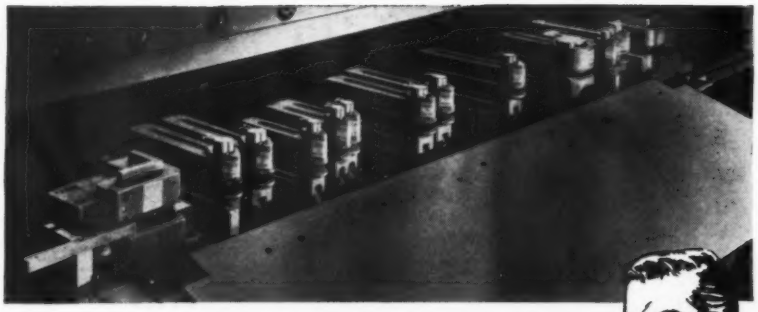
FEEDING AND STRAIGHTENING MACHINE WITH COIL CRADLE
Straightens and feeds stock .125" thick x 72" wide at speeds up to 180 f.p.m. Driven through hydraulic drive transmission by a 25 h.p. motor.

F. J. LITTELL MACHINE CO.
Speed with Safety
4197 Ravenswood Ave. Chicago 13, Ill.

ROLL FEEDS • REELS • STRAIGHTENING AND FEEDING MACHINES • COIL CRADLES • SHEETING LINES
District Offices: Detroit, Cleveland

LITTELL CATALOG 56
gives details on the complete Littell line—write for your copy.

CIRCLE INFORM-A-GRAM KEY NO. 45



"**WALES BL TOOLING** is fast and accurate in our shop. Punches, dies and stripping mechanism are all contained right in the tooling, so our presses have a minimum of down time for change-overs. BL's are just about perfect for punching stock up to ⅛" thick and we get any type of pattern needed with the same units."

Nothing attached to the press ram. Alignment of punch and die is permanent. Notching equipment may be used in same set-up. Inventory is kept down and PRODUCTION UP!

SEND FOR BULLETIN NO. 27K

The complete story of BL tooling is here for the asking. Send for your copy today.

WALES Strippit COMPANY

AKRON, NEW YORK

WALES-STRIPPIT OF CALIF., SOUTH GATE, CALIF.
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

"...the Wales-Way is the PLUS-PROFIT way"

CIRCLE INFORM-A-GRAM KEY NO. 46

Presenting . . . Representing . . .

Three companies have been appointed to represent the Colonial-Romulus Division of the Colonial Broach and Machine Co. They are A. S. Guile Co. of Dayton, Ohio, Interstate Equipment and Engineering Co. of Chicago, and T. S. Mellen of South Bend, Ind.

•

The Johnson Tool & Supply, Inc., of Des Moines, is the sales representative in the Iowa area for Size Control Co.

•

A tool stocking distributor program has been begun by Elgin National Watch Co. and the following distributors have been named: in Arizona, Roy J. Heyne Machine Co., and Circle Sales Co., Phoenix; in northern Ohio, Clark-Campbell Tool Sales Co., Cleveland; and in central Indiana, Browning Tool and Supply Co., Indianapolis.

•

Vulcan Crucible Steel Division, H. K. Porter Co., Inc., has appointed Harbor Steel & Supply Corporation of Muskegon, Mich., as a distributor in western Michigan for Vulcan's tool steel products.

•

Henry R. Hansen, Denver, is the Colorado and Utah dealer for The Cushman Chuck Co.

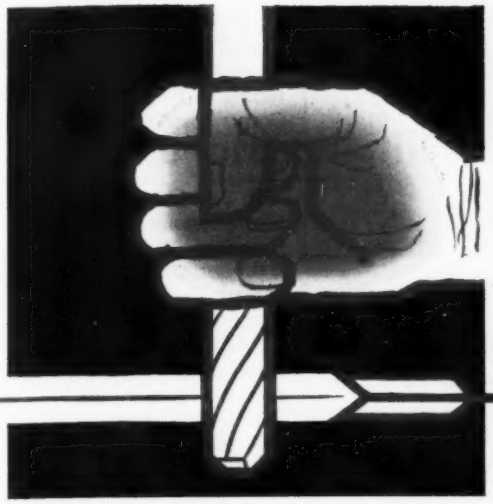
•

Five stocking distributors for its line of specific taps and other treading tools and gages has been announced by Detroit Tap & Tool Co. They include The J. L. Axelson Co., San Marino, southern California; Robert O. Butler Co., Manlius, N. Y., north-eastern New York; Cascade Tool Sales, Portland, Ore., the Pacific northwest; Lauderdale Tools, Ft. Lauderdale, southern Florida; and Midwest Supply Co., Tulsa, Okla., west central states.

•

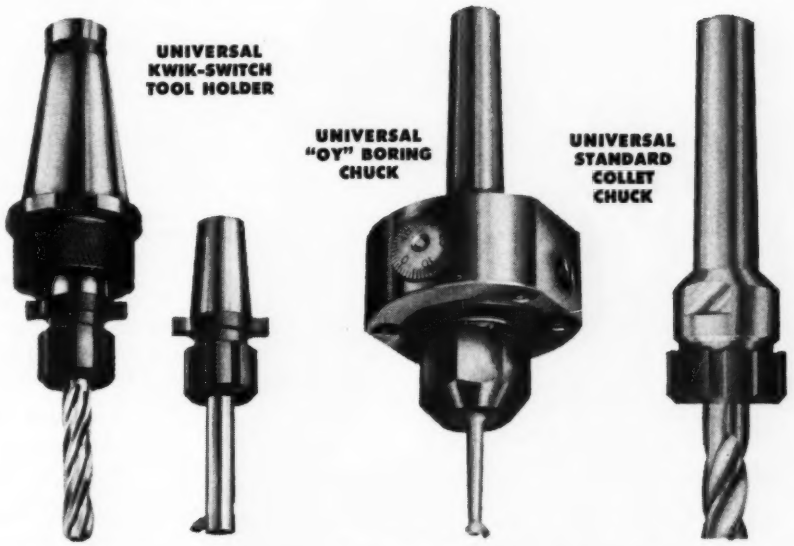
The Seco lines of hydraulic equipment made by Simplex Engineering Company, a recently acquired subsidiary of Racine Hydraulics & Machinery, Inc., will be distributed by DeShazo & Thomas of Birmingham, Ala.; Landes, Zachery & Peterson of Denver; J. E. Dilworth Co. of Memphis; Hydraulic & Air Equipment Co. of Portland, Ore.; Tridel Equipment, Ltd., Vancouver, B. C.; and Garrett Burgess, Inc. of Detroit.

. . . *Continued on page 48*



positive
grip
and true-running
tools

ARE CERTAIN WITH UNIVERSAL CHUCKS SUCH AS THESE:



A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. This positive grip, plus the precision manufacturing of all Universal chucks, keeps tools running true to .001" within an inch from the nose of the chuck. Our simplified chuck design eliminates auxiliary bearings, resulting in low cost to you. Sizes range from 1/16" to 1 1/2", with shanks to fit any machine. For complete information on these three or other Universal chucks, write the office nearest you: Universal Engineering Sales Co., 1060 Broad St., Newark, N. J., 5053 Sixth Ave., Kenosha, Wis., or our home office in Frankenmuth.

UNIVERSAL ENGINEERING COMPANY

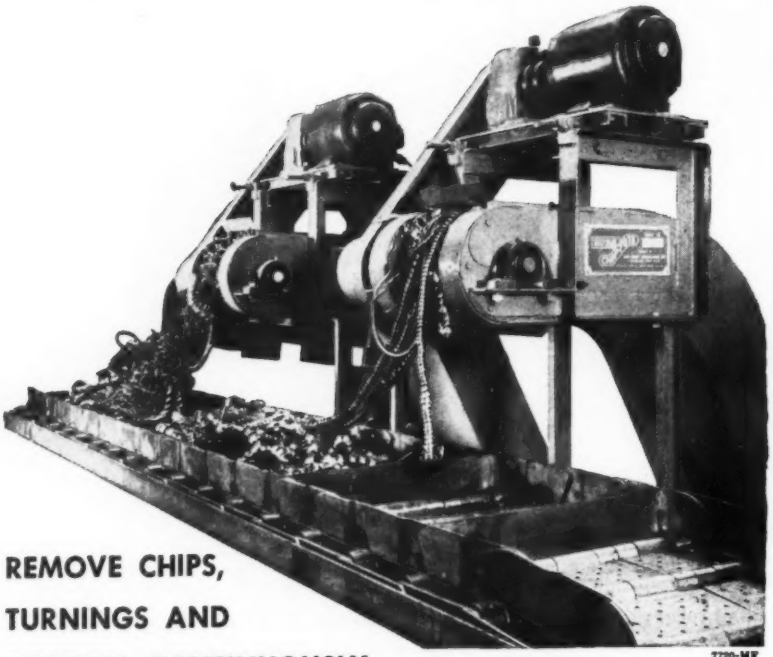
FRANKENMUTH 8, MICHIGAN

195

CIRCLE INFORM-A-GRAM KEY NO. 47

LOOK...NO HANDS!

That's right! The May-Fran CHIP-TOTE permits the continuous operation of machine tools by eliminating down-time for scrap removal . . . skilled workers stay on the job . . . production increases by as much as 20%! Versatile CHIP-TOTE conveyors are available in a wide range of sizes to serve practically any type or size of machine tool. Conveyor speed is adjusted to meet the scrap removal needs of the machine.



7720-MF

REMOVE CHIPS, TURNINGS AND BORINGS CONTINUOUSLY AND AUTOMATICALLY WITH A **MAY-FRAN CHIP-TOTE**

Write today for your copy of Bulletin MF-640

MAY-FRAN

ENGINEERING, INC. 1726 Clarkstone Rd., Cleveland 12, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Presenting from page 46

Roll Formed Products Co., producer of metal shapes and roll formed tubing, has appointed The Bohaker Corp., Boston, as the New England sales representative.

•

H. J. Weber & Co., Chicago, has been appointed a distributor for Hamilton Div'n of Baldwin-Lima-Hamilton Corp., and R. L. Crane Machinery Co., a distributor in the Buffalo-Jamestown, N. Y., area.

•

Production Tool Co. is the representative in northern Ohio for Taft-Peirce Mfg. Co., manufacturers of tool room equipment, and production and inspection equipment.

•

Detroit district manager of Norton Co.'s Grinding Machine Division is **Irwin W. Peterson.**

•

The Watson-Stillman Press Division, Farrel-Birmingham Co., announces the appointment of **T. R. Callahan** as their mid-western sales representative. His headquarters are in Chicago.

•

Robert DeDobbelaere now serves as district sales manager of The Abrasives Division of Elgin National Watch Co. in the midwest and southern area. He is located in Indianapolis.

•

L. G. Johnson, is serving in the Los Angeles sales office of The Cleveland Cap Screw Co. He will cover the southern California and Arizona area.

•

Five new district sales representatives have been appointed by Firth-Loach Metals, Inc. They are **Peter C. Patterson,** Chicago area; **Gordon W. Carlton,** northern Ohio; **Clyde W. Smith,** Indiana; **Frank Glaub,** Buffalo-Rochester; and **Henry E. Zarges,** eastern Pennsylvania, New Jersey, and Maryland.

•

The Onsrud Machine Works Inc., Portable Tool Division, announces the appointment of **Norman A. Stevenson** as midwestern factory sales representative.

•

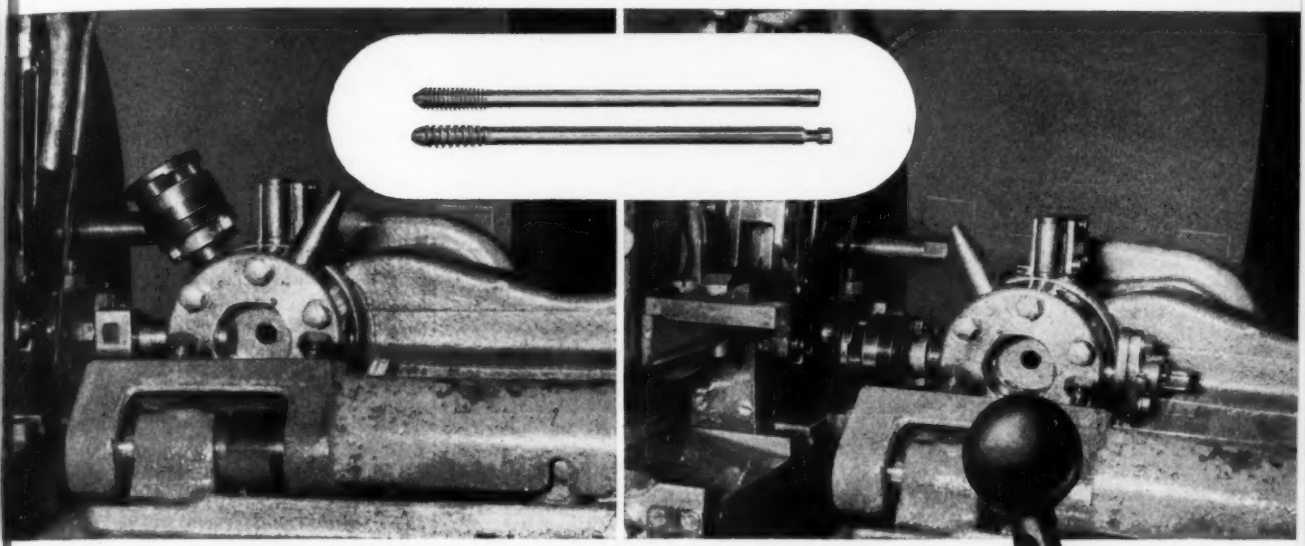
Newly-appointed sales manager for Black & Webster Inc., is **J. E. Barber.**

•

Arthur S. Down has been named eastern division sales manager for Flick-Reedy Corp. He will be responsible for sales of both the Miller Fluid Power Division and Tru-Seal Division.

Westinghouse adds new productive capacity to present metal turning equipment

and eliminates costly secondary machining operation



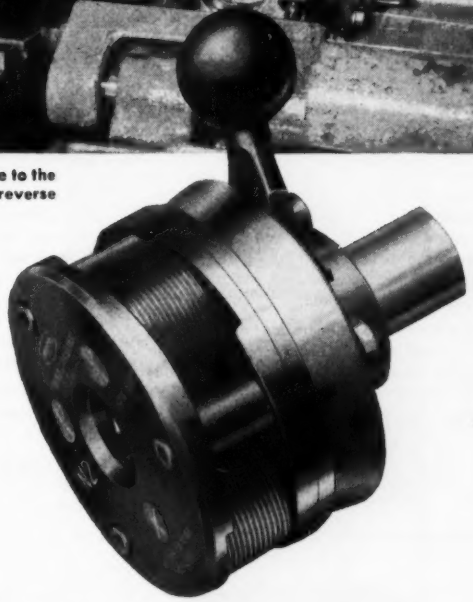
In this setup, on a Brown & Sharpe automatic, down time was reduced to a minimum, due to the fact that it was possible to thread more than 500,000 pieces before it was necessary to reverse the rolls—a distinctive Acme-Fette feature which doubles the life of threading rolls.

ROLLS THREADS . . . faster and better

WITH NEW ROTATING — NON-ROTATING

Acme-FETTE

THREAD ROLLING HEAD AND ROLLS



With an Acme-Fette THREAD ROLLING HEAD in the primary setup, Westinghouse completed these electric appliance terminals without a secondary machining operation. Time saved in rehandling alone more than equalled the cost of the head and rolls.

Acme-Fette Thread Rolling Heads are available in 8 sizes, in capacities from 1/16" to 2", at only a fraction of the cost of specialized equipment. The same head can be used in both rotating and non-rotating spindle machines—either horizontal or vertical.

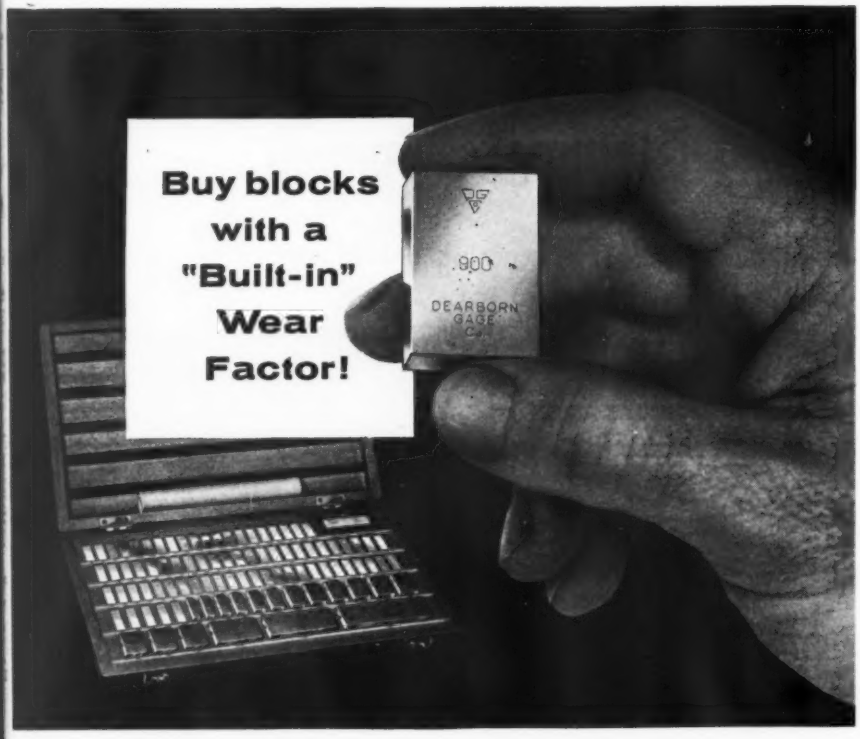
For cost-reducing ideas showing how you can combine thread rolling operations on your present equipment, send for Catalog NAF-57.

- Makes threading from the end now possible on any rotating or non-rotating spindles.
- Rolls threads up to 5 times faster than—and without chip problems associated with—thread cutting.
- Provides smoother threads, of consistently closer tolerance, with greater tensile strength—and without cratering at the thread crest.

National Acme

THE NATIONAL ACME COMPANY, 169 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 49



ELLSTROM CHROMIUM PLATED GAGE BLOCKS are guaranteed "minus nothing" from nominal size!

Here at last are gage blocks with a positive "built-in" wear factor! The only blocks ever produced and priced as standard with dimensional accuracy unconditionally guaranteed to be within specified millionths on the "plus" side of nominal block size and minus "zero" . . . absolutely nothing . . . undersize!

This complete elimination of the conventional minus tolerance gives you, the gage block user, three new and exclusive benefits. First, it provides positive assurance against receiving new blocks that are actually "worn" undersize during manufacture before they are ever used. Second, it gives you finer, more practical accuracy . . . with the sure knowledge that every Ellstrom block you buy will start wearing *toward* its nominal size rather than *away* from it. And third, it gives you a guaranteed minimum wear factor equivalent in millionths to the full minus tolerance specified as standard for all other makes of blocks!

Write for descriptive literature containing complete price information today!

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Ellstrom Gage Block Accuracy Guarantee

"W"—WORKING ACCURACY BLOCKS
Measured Length: +.000008"/−.000000"
Parallelism: .000004" Flatness: .000004"

"I"—INSPECTION ACCURACY BLOCKS
Measured Length: +.000004"/−.000000"
Parallelism: .000003" Flatness: .000003"

"L"—LABORATORY ACCURACY BLOCKS
Measured Length: +.000002"/−.000000"
Parallelism: .000001" Flatness: 000001"

Ellstrom—your best buy in gage blocks for shop and tool room use, inspection and laboratory applications. Available in 28 standard sets ranging from 8 to 92 blocks in both square and rectangular styles with or without basic gage block accessories.

CIRCLE INFORM-A-GRAM KEY NO. 50

MEN YOU SHOULD KNOW

Northwestern Tool & Engineering Co. has announced the promotions of **Wilfred Quinter** to production foreman and **James Wallace** to inspection and quality control supervisor.

•

Kenneth H. Meyer has been appointed director of engineering by C. B. Hunt & Son, Inc.

•

Crouse-Hinds Co. has made known two promotions. **Albert H. Clarke,** former vice president for engineering, has been named vice president for manufacturing. He will direct and coordinate all manufacturing, industrial engineering, employee relations, production planning, and procurement for Crouse-Hinds. His successor as vice president for engineering is **Russell P. Northup,** who will supervise the company's product research and development programs.

•

M. L. McCartney is serving as works manager for the distribution transformer department of the Westinghouse Transformer Division at Sharon, Pa. McCartney replaces **C. E. Hutchison** who was recently named works manager in Athens, Ga. **E. B. Lawrence** has been named superintendent of operations for the distribution transformer department, replacing McCartney.

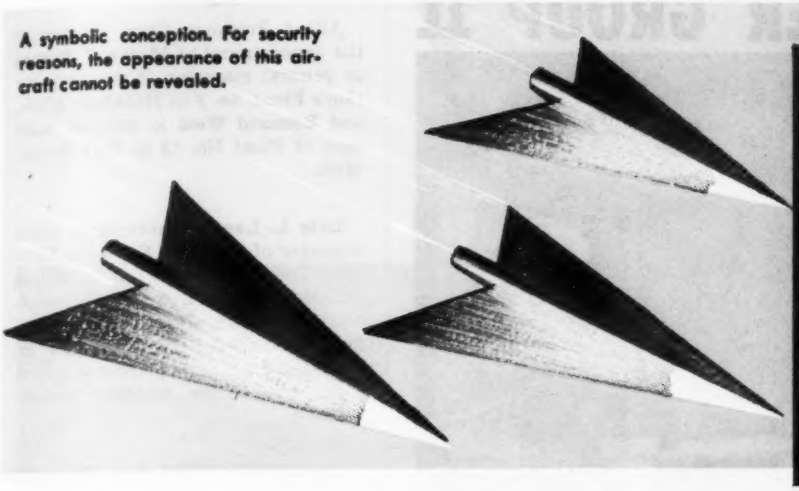
•

New chief engineer of conventional gages of the Pratt & Whitney Company's Gage Division is **Jay E. Watson. Edward P. Gillane,** president of the Pratt & Whitney Co. and chairman of the board of Potter & Johnson Co., has also been named executive vice president in charge of industrial operations for the Penn-Texas Corp. He will continue as chief executive officer of Pratt & Whitney, a Penn-Texas subsidiary.

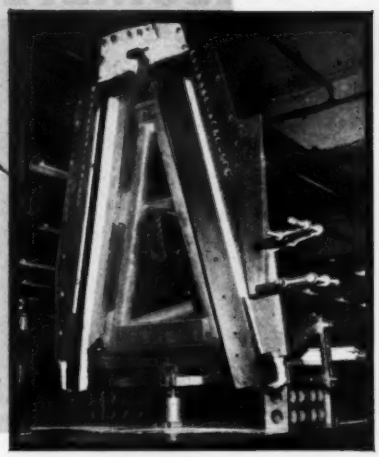
•

The advancement of **Milton J. Steffes** from vice president of sales and engineering to vice president and works manager, has been made known by Super Tool Division, Van Norman Industries. He will be assisted by **Bernard J. Bretza. Lawrence A. McDonald** has been appointed sales manager, and **Paul W. Leming** has been elected executive vice president of the Van Norman Machine Company Division.

. . . *Continued on page 52*



A symbolic conception. For security reasons, the appearance of this aircraft cannot be revealed.



A master drill and setting gauge, showing use of Epon resins to duplicate compound curves and contours.

In building the supersonic Arrow . . .

Avro Aircraft, Limited saves time and money with

EPON® RESIN

dies, tools, jigs, molds and fixtures

Avro Aircraft, Limited—developing Canada's supersonic Arrow—is achieving major savings with Epon resin tooling.

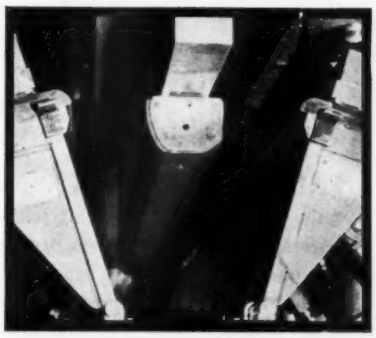
Epon resins provide faster, lower cost preparation of stretch dies, forming tools, drop hammer dies, jigs, duplicate master die molds, checking and assembly fixtures. Avro reports that in making dies of Epon rather than metal, manpower requirements are two-thirds less, which is reflected in correspondingly great savings in the unit cost of tooling.

The Epon resins have an ideal combination of properties for tooling applications. To list just a few:

- Exceptional dimensional stability, high impact strength, excellent resistance to abrasion, minimum residual stress in cured parts.
- Ease and speed of preparation.
- Low shrinkage in filled formulations, assuring perfect master reproduction; minimum warping and stresses.
- Adaptability to repairs and design changes.
- Minimum finishing requirements for smooth surfaces.

Like Avro, other leading manufacturers report savings as high as 80% with Epon resin tools and dies—for *production* as well as experimental and short-run work. Can you make comparable savings in your own operations? Find out by writing for technical literature on Epon resins for tool and die applications.

Epon-faced die requires only hand rubbing to achieve smooth finish. Radii are being touched up with sander.



Stretch die, with Epon resin facing of involved contours, ready for run on 800-ton press.

SHELL CHEMICAL CORPORATION

CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco • St. Louis
IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited • Montreal • Toronto • Vancouver

SHELL

CIRCLE INFORM-A-GRAM KEY NO. 51

PROFILOMETER® GROUP II

An Unusually Handy Combination for Dependable Roughness Measurement

THIS equipment will measure the microinch roughness of every surface that *needs* to be measured, in most plants — with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop men — and includes the following items:

AMPLIMETER — Shows all roughness measurements from 0 to 1000 microinches, on an easy-to-read meter. Factory-calibrated for dependability.

TYPE LJ TRACER — Measures on OD's as small as 1/8" — ID's as small as 1/4" — flats — tapers — narrow splines. Passes through a 3/4" hole.

MOTOTRACE AND LINKARM — Give the Tracer a *steady support* and *smooth motion,* essential to dependable measurement. No operator skill required.

FREE BULLETIN LT17 gives details. Write for it! ● And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

You can DEPEND on the PROFILOMETER — first in surface roughness measurement since 1936.

Profilometer is a registered trade-mark.

MMC® MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 52

. . . Men from page 50

Allied Products Corp. announces the appointment of **Myron C. Sarnes** as general manager of the corporation's Plant No. 3 in Hillsdale, Mich., and **Edmund West** as general manager of Plant No. 13 in Port Huron, Mich.

•

Lyle L. Lenth is serving as plant manager of the A. B. Farquhar Division, The Oliver Corp. **F. L. Wilson** succeeds Lenth as general superintendent. General foreman supervising the machine shop, **William H. Geiselman,** replaces Wilson as superintendent of the methods department.

•

The promotion of **John Montean** as manager, Cri-Dan Division of The Lees-Bradner Co., has been revealed. He was formerly the division's chief tool designer.

•

Allen E. Hermanson is the new manager of the Machine Tool Division of Sundstrand Machine Tool Co. in Belvidere and Rockford, Ill. He was formerly the assistant manager.

•

Worcester Pressed Steel Co. has appointed **Fred C. Valentin** as manufacturing engineer. He will have full responsibility for estimating, tool design, and construction.

•

The advancement of **Oliver K. Kelley,** head of the transmission development group at General Motors, as chief engineer of Buick Motor Division, has been announced by the company. **Donald F. Taylor** was named general manufacturing manager, succeeding **Jesse L. Powers,** who is retiring.

•

The board of directors of The Timken Roller Bearing Co. has elected **Dwight A. Bessmer** executive vice president of the company. He formerly served as vice president.

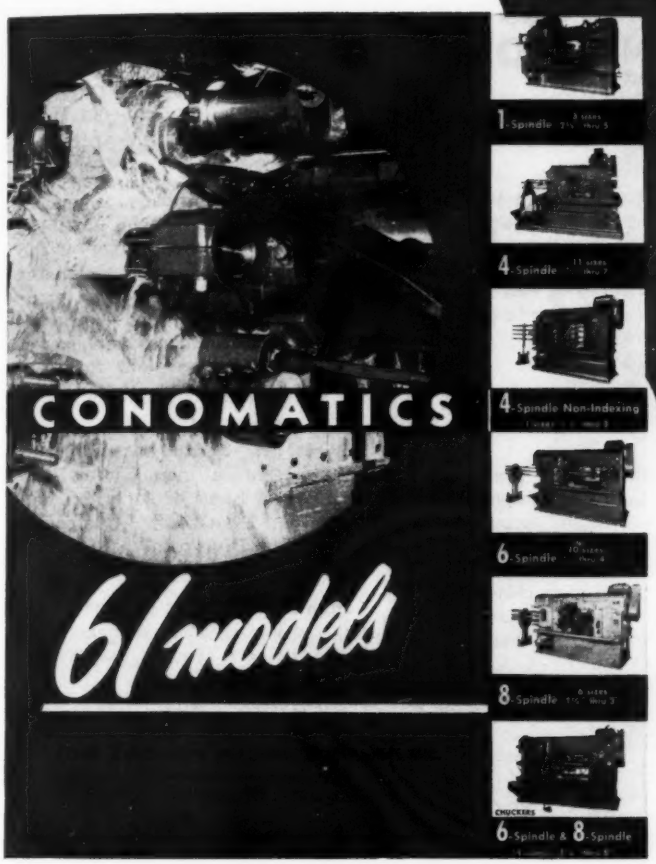
•

The Carpenter Steel Co. has appointed **Samuel E. Tyson** as metallurgist, Stainless Steels.

•

Election of **Dale V. Cropsey** as vice president in charge of industrial divisions for Elgin National Watch Co. has been announced by the company. **H. E. Rich** is now vice president and general sales manager of its Watch Division.

. . . *Continued on page 54*



61 models

A machine not put to its best use is theoretically idle. Proper machine selection is an important factor in the profitable use of a multiple spindle automatic. So extensive are the demands on this type of lathe that no single model—or number of models—can be expected to efficiently handle the wide range of work available.

To excel in any range of work a multiple spindle automatic must be specifically designed for that range. That is why CONOMATICS are provided in so many models. In no other way can the purchaser be assured of the best possible machine for his particular requirements.

Write for your copy Today

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 53

3 Solid Reasons why... Jarvis

SOLID CARBIDE TOOLS BREAK PRODUCTION RECORDS

Precision

Jarvis Solid Carbide Tools enjoy an enviable reputation for outstanding quality and precision. Standard or custom tools are thoroughly inspected, guaranteeing the closest possible tolerances. Through constant research and testing, Jarvis is able to recommend the specific carbide grade for maximum performance.

Economy

With Jarvis Solid Carbide Tools production *days become hours* . . . product machining costs tumble! Specific case histories* prove tremendous savings in tool life, production hours and machinists time. End worry and waste on conventional milling! On hard-to-machine materials, you'll save with Jarvis Solid Carbide Tools. Let Jarvis recommendations solve all your tooling problems! *Available on request in writing.

Service

Jarvis representatives are specialists in Carbides and power tools and their applications. 165 representatives are as near as your telephone and are available for consultation on standard or custom tools. A Jarvis representative—specializing in service—can trouble-shoot your tooling problems in your plant, and solve them economically.

- Tungsten Carbide Rotary Files
- Solid Carbide End Mills
- Special Mills
- Solid Carbide Reamers
- Internal Grinding Tools
- Solid Carbide Drills
- Boring Bits
- Boring Tools
- Special Solid Carbide Tools
- Rotary Files
- Midget Rotary Files
- High Speed Rotary Files

. . . . . and Custom Solid Carbide Tools.

Send today for catalog describing hundreds of —Production Increasing— Precision Ground Carbide Tools completely illustrated.

Jarvis
CORPORATION
POWER TOOLS FOR INDUSTRY
MIDDLETOWN, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 54

. . . Men from page 52

Wilbur L. Kennicott has been elected a vice president of Kennametal Inc., after heading the company's engineering activities. **Edgar W. Engle** is serving as development engineer and is concerned with the development of new products in connection with the company's current expansion program.

•

Russell Bellinger has joined the design engineering staff of the Air Gage Division, Dearborn Gage Co. He will be responsible for the design of the company's air gaging products.

•

E. W. Bliss Company announces executive changes. **John Lindberg** has taken over as manager of the Canton Division, **Richard Y. Moss** is serving as manager of special products sales at Canton, and **Charles E. Peterson** has been named manager of manufacturing operations for Mackintosh-Hemphill.

•

Robert H. Smith has been appointed technical manager for Present Product Lines of American Machine & Foundry Company's Engineering Division.

•

John Petrovich has been named to the position of sales manager and assistant to the general manager for Mohawk Tools, Inc.

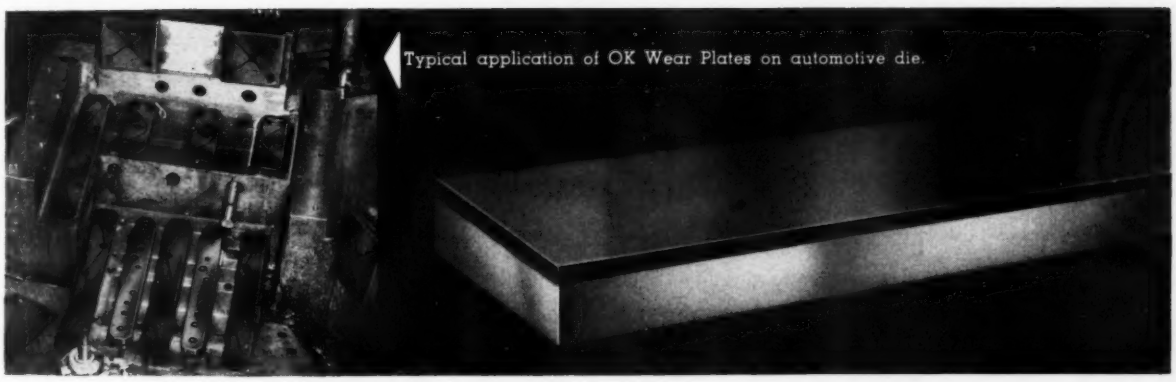
•

Appointment of **Martin J. Caserio** to succeed **Warren E. Milner** as manager of Milwaukee operations of AC Spark Plug Division of General Motors, has been announced. **Glen R. Fitzgerald** will succeed Caserio as director of engineering and equipment sales for the Flint plants. Fitzgerald has been chief engineer, automotive products. **Leo. W. Tobin, Jr.**, acting resident engineer for AC-Milwaukee, was appointed chief automotive engineer to succeed Fitzgerald. Milner is becoming general manager of the Hyatt Bearings Division, replacing **D. L. Boyes**, who will be the new general manager of Delco-Remy Division.

•

The Universal-Cyclops Steel Corp. announces the appointment of **Richmond P. Hobson** as works manager for its new stainless steel plant to be built at Coshocton, O. Formerly manager of the bar, wire, and strip mills at Bridgeville, Pa., plant, he will direct and be responsible for the planning, engineering, and staffing of this plant.

don't overlook this way to save on your production costs



Typical application of OK Wear Plates on automotive die.

OK aluminum bronze wear plates for cam dies are now being used by the majority of appliance builders and automotive body makers. Here's why: You save approximately 40% under the cost of expensive solid bronze wear plates . . . and you receive completely finished wear plates, available from stock, ground to ± .0005 parallel and flat. By a unique cladding process, long-wearing aluminum bronze is bonded to a steel base, easily machinable for fitting to dies. Drilling or counterboring can be done through bronze surface if required. Wherever your die has a sliding or cam action, you'll achieve finer results with OK aluminum bronze wear plates. Complete information is contained in our new OK Catalog. For your free copy, write Dept. 58-LL.

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

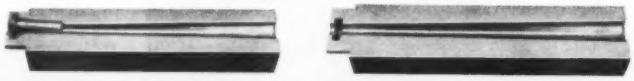
SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • WORK-REST BLADES • CUT-OFF BLADES • SCRAP CHOPPERS • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

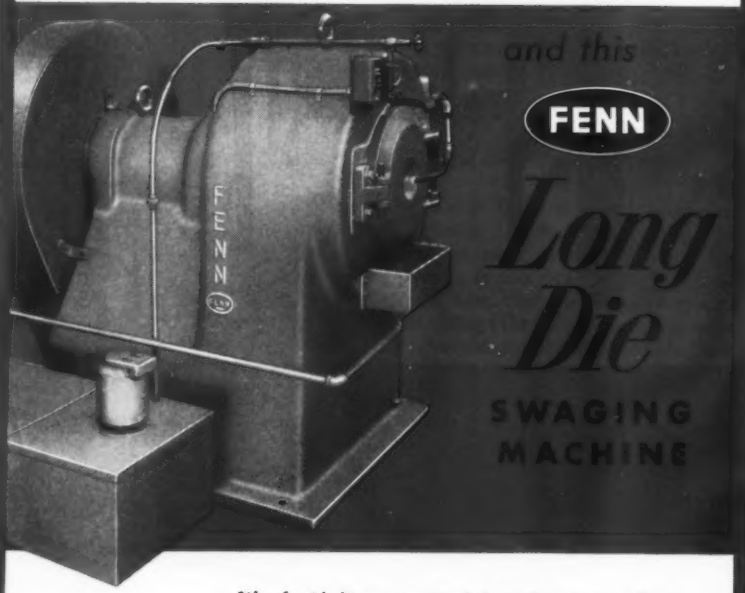
CIRCLE INFORM-A-GRAM KEY NO. 55

TAPERING THE MODERN WAY

15" TAPERS IN A SINGLE PASS

WITH THESE DIES . . .





It's fast! It saves metal and money. Fenn Long-Die Rotary Swaging greatly simplifies the production of long tapered tubular products (such as tubular furniture legs). Model 4½F will produce tapers up to 15" long on tubing up to 2¼" diameter in a single pass and at a production rate of up to 6 per minute with manual feed. This includes welded tubing and seamless tubing on ferrous or nonferrous metals, from stainless to aluminum. Work leaves the machine with a fine finish. If your product requires tapering, it will pay you to write for all the facts on Fenn Long-Die Swaging.

FENN LONG DIE *Swaging Machines*

FENN MANUFACTURING CO.
206 Fenn St., Newington, Conn.

Coming Events

Nov. 1-3. Metal Treating Institute. Annual Meeting. Hotel Sheraton, Chicago.

•

Nov. 2-8. American Society for Metals. National Metals Exposition and Congress, and Second World Metallurgical Congress. International Amphitheatre, Chicago.

•

Nov. 4-6. Society of Automotive Engineers. National Transportation Meeting. Hotel Statler, Cleveland.

•

Nov. 11-13. Electronic Industries Association. 1957 Radio Fall Meeting. King Edward Hotel, Toronto, Canada.

•

Nov. 13-15. American Standards Association. Eighth National Conference on Standards. St. Francis Hotel, San Francisco.

•

Nov. 18-21. Air Conditioning & Refrigeration Institute. Air Conditioning and Refrigeration Show. International Amphitheatre, Chicago.

•

Nov. 18-22. American Standards Association. Standardization Seminar. St. Francis Hotel, San Francisco.

IF YOU DESIRE ADDITIONAL INFORMATION REGARDING ADVERTISED PRODUCTS OR EDITORIAL ARTICLES USE THE INFORM-A-GRAM CARD ON PAGE 166.1

MAKE WESPO YOUR DESIGN STANDARD for ALL WORKHOLDING NEEDS

WESPO TOGGLE CLAMPS & PLIERS

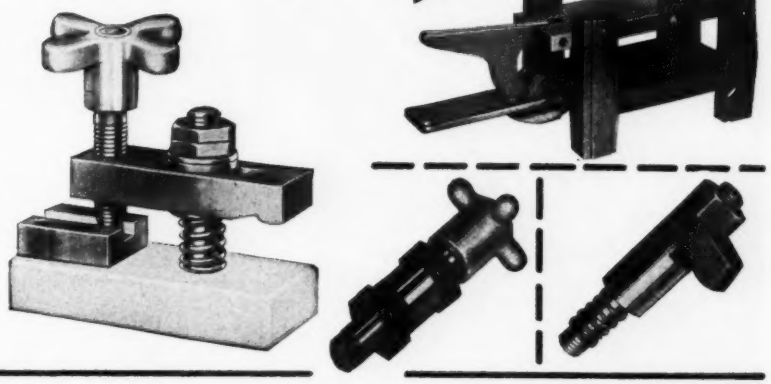
Over 80 types and sizes. From ⅜" Midget to 12⅝" Clamp. PLIERS — from 1⅜ Jaw Midget to 4¼ wide Jaw.

WESPO Toggle Clamps are made in types and sizes to meet all workholding needs, light, medium and heavy duty. Features include: REAMED HOLES, for better bearing, HARDENED BUSHINGS — SERRATED to prevent turning — HIGH TENSILE STRENGTH RIVETS for longer service.

WESPO FIXTURE CLAMPS

Over 170 Types and Sizes

WESPO fixture clamp assemblies save up to 70 percent on your own designing and machining. They are used as standard by a large number of leading manufacturers.



WESPO COMPONENTS

Over 1,000 types and sizes available from stock.

WESPO parts are precision manufactured of quality steel — heat treated and rustproofed. They are designed for heavy duty and long wear and have proved their value in many industries.

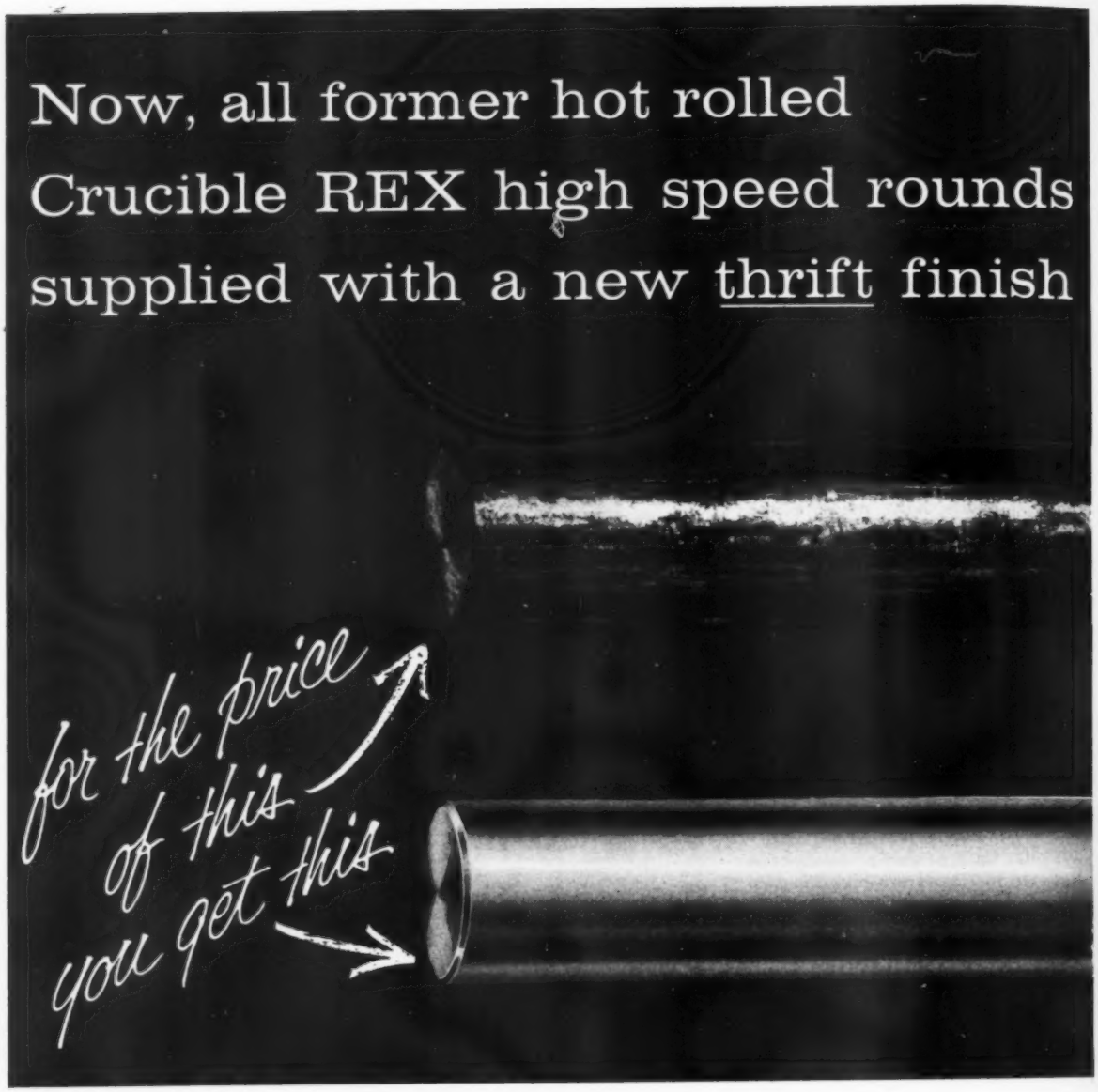
ADJUSTABLE SPINDLES FOR TOGGLE CLAMPS with BONDED NEOPRENE CAPS

Write for Catalogs —
TOGGLE CLAMPS & PLIERS, FIXTURE CLAMPS and PARTS

WEST POINT MFG. CO.
26935 W. 7 Mile Road • Detroit 19, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 57

Now, all former hot rolled Crucible REX high speed rounds supplied with a new thrift finish



Here's a revolutionary, new Crucible policy designed to provide an improved product—save time and processing costs. Now, Crucible furnishes all REX® high speed rounds from 5/8" up with a machined surface, close to size and free from decarburization. All bars from 1/4" to 5/8" round are supplied cold finished.

This new *thrift* finish means important savings to you – whether you've been paying extra for decarburization and stock removal, or grinding or rough turning rounds in your own shop. Of course, where extremely close tolerances are demanded, precise centerless grinding is still available at a small extra.

It's another Crucible "first" that offers you substantially more for your high speed steel dollar. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

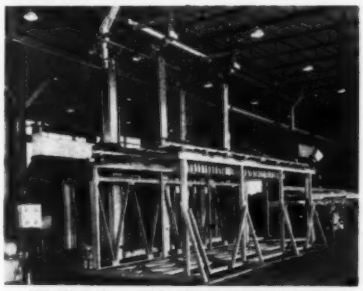
CIRCLE INFORM-A-GRAM KEY NO. 58

TADMU MAKES PLATING MACHINES FASTER, BETTER, CHEAPER

To improve automation in the mechanical end of the plating field, where technological developments have been slow for many years, the plating equipment division of Wagner Brothers, Inc., recently introduced "tadmu," their ungainly looking "test and development mock-up" — their equipment designers' and production specialists' master slave.

Using information gained by experimenting with the 12-ton, 31' production floor lab, the company has been able to develop an over-all system of manufacturing which makes possible the quick creation of automated, custom-ordered plating equipment, and subsequent fabrication on a semi-mass production basis. It promises to reduce costs of plating equipment installation for users, and plating operation costs.

Cost reductions for the user, Wagner engineers believe, will come partly from short-cut manufacturing procedures developed, partly from quicker deliveries, and partly from the many mechanical design firsts being built into each newly ordered machine to provide trouble-free plating production.



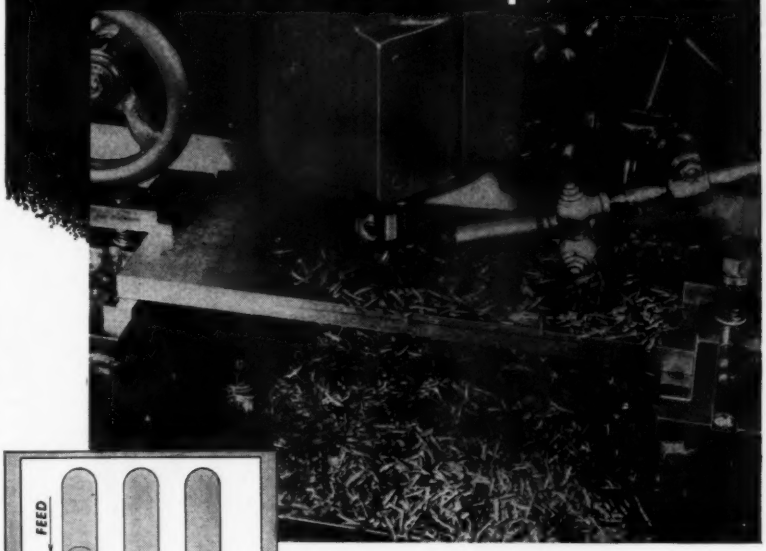
"Tadmu" provides basic engineering and production information to change plating machine building, and also is used to test new ideas for further development. It is a huge production floor lab.

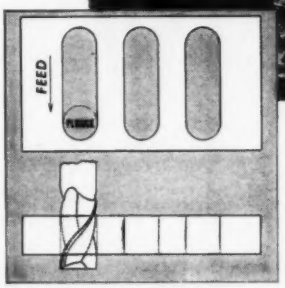
More specifically, tadmu has evolved a design approach which has eliminated 65% of the time required to lay out a custom plating machine — it has cut delivery time from 10-20 weeks to 4-8 weeks. It has increased the use of modular construction, which enables the fabrication of custom components from standard sections, and has hastened the development of 15 innovations in equipment component design which eliminate many mechanical headaches.

Tadmu actually represents 1½ modular repetitive sections of an actual automatic plating machine, on

Brown & Sharpe CHIPS

End Mills Designed with Economical Chips in Mind





Center cutting End Mill plunges vertically into workpiece. When milling a slot to desired width, metal removal is concentrated on the peripheral teeth.

High Speed Slotting with High Speed Steel End Mills

The cutting efficiency designed into Brown & Sharpe Fast Spiral End Mills is shown by the accumulation of large, uniform chips—your best clue to cutter performance. Even at high speeds, the chips flow smoothly away from surfaces being machined.

Each tooth of a Brown & Sharpe PRODUCTIONEERED End Mill is ground with double-angle lands . . . combines correct relief with increased strength of the cutting edge. Fast Spiral End Mills are especially designed for rapid cutting action, reduced power consumption.

Whether you specialize in long production runs, or perform precision toolroom work, milling cutter efficiency is an important item in your budget. For maximum speed, accuracy —and economy—always specify Brown & Sharpe PRODUCTIONEERED Cutters!

Write for 80 page Brown & Sharpe Catalog showing over 2300 High Speed Steel Tools and Accessories.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe

BROWN & SHARPE MFG. CO. • PROVIDENCE 1, RHODE ISLAND

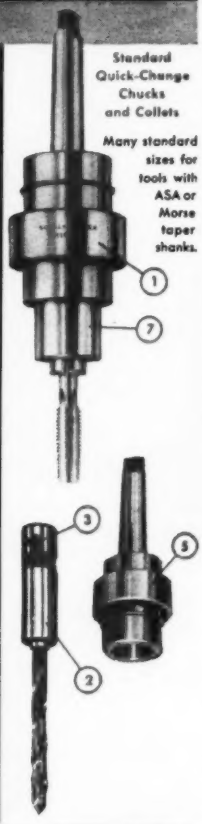
STOCK OF OVER 3000 STANDARD TOOLS!
Obtain impartial High Speed Steel, Carbide and Carbide Tipped tooling recommendations from your Brown & Sharpe-NELCO Distributor.

CIRCLE INFORM-A-GRAM KEY NO. 59

SCULLY-JONES QUICK-CHANGE CHUCKS AND COLLETS

ASSURE GREATER OVER-ALL ECONOMY FROM YOUR MACHINES AND CUTTING TOOLS

These benefits	..for these reasons	..result from these PREMIUM features
INCREASE PRODUCTION		1. Operator merely lifts locking ring, without stopping machine, and the collet with cutting tool drops out.
		2. Operator inserts replacement collet in one easy motion. Ring falls into place by gravity, and machine is ready for next operation.
		3. Exclusive keyhole-type drift slot permits ejection of tools by a simple twist of the wrist, using "Scully-Drift" or cam-type tool ejector.
REDUCE CAPITAL AND OPERATING COSTS		4. Give multiple-spindle range to single-spindle machines used for sequence operations like drilling, counterboring, reaming, and tapping.
		5. Locking ring holds collet firmly and securely in chuck, providing a positive drive to the two balls which are the driving mechanism.
		6. Chucks are heat-treated and ground to prevent distortion and "nicking."
ASSURE SAFE OPERATING CONDITIONS		7. No ears or sharp edges on locking ring, and ample projection of collet, eliminate possible injury to operator when changing tools in motion.



SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1913 South Rockwell St., Chicago 8, Ill.

for profit-minded tool buyers!

COUNTERBORES and COUNTERSINKS

Give you rigidity and concentricity needed for accurate work, longer life.

LIVE CENTERS

Take shock and abuse of heavy loads turning at high speeds.

"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes . . . protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.

CENTER DRILL DRIVERS

Offset splined section gives positive drive in drill flutes and protects cutting edges.

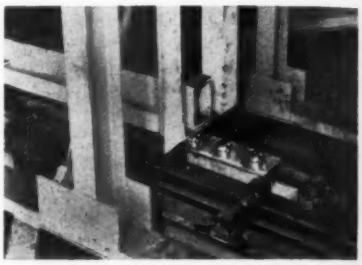
DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

CIRCLE INFORM-A-GRAM KEY NO. 60

an enlarged scale. It simulates exact operating motions of an actual plating unit, and is used by Wagner engineers as a proving ground for developing and testing improvements in plating machine structure and operation.

It was from this working mockup that the company came up with a design approach that adopts some of the principles of lofting used by the aircraft industry. The aluminum lofts used by Wagner include every modular structural and mechanical advancement made by the company thus far, scaled to an accuracy of 0.003". With this system the engineers pick off the lofts any plating machine element features desired for a custom ordered machine. These are quickly combined into a master working blueprint for manufacturing. It has cut the number of engineering man-hours necessary to complete a job from 1300 to 350 or 500.



Typical of the improvements made via the Wagner mockup is the application of ball rather than roller bearings for carriage movement in plating equipment. Here ball bearing tracks of four different types of special steel are tested.

From this method of fabrication, for example, a giant 45-foot fixture was developed that enables two men to tack and final weld pre-cut steel structural members for the base and uprights of a typical plating machine in 50-60% less time than formerly required. All steel members used are ordered pre-cut to standard dimensions direct from the mill to form any section of a machine.

Another feature of modular construction is the mechanical "splicing" method used to join the various modular sections together. This enables plating machines to be built completely on the production floor, tested and shipped out with a minimum of dismantling. Thus plating machines can be "cut" or sectionalized in any convenient length for shipping purposes, merely by removing a few bolts, and reassembled at the installation site, ready for dry cycling in relatively few hours.

Major advantages of the develop-

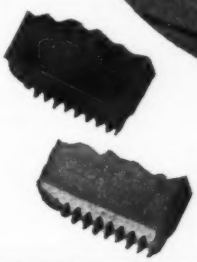
. . . Continued on page 62

V-B Liquid Honing*

Your Way to Say:

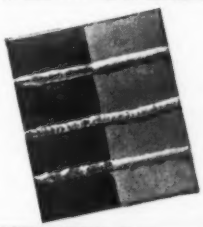
"MOST MODERN PRODUCTION BLASTING EVER DEVELOPED!"

This Machine Should be Processing Your Parts



Vapor Blast Liquid Honing removes heat treat scale faster than conventional tumbling or any other process, and without pitting the steel.

Vapor Blast Liquid Honing blends out grind lines, as shown in the area to the left. The smooth, non-directional surface is ideal for oil flow and unequalled lubrication. Liquid-abrasive action also hones down tiny burrs along the edges of parts like this one.



This unretouched photo of three weld seams shows how efficiently you can remove mill scale, rust, welding and heat discolorations. Top weld is stainless steel; next, copper brazing; bottom, common steel.

For surface conditioning or finishing, a switch to Liquid Honing will save you a superintendent's pay in a year or less. Metals, plastics, ceramics — any material you use — can be Liquid Honed fast and to close tolerance. You get a better production job every time . . . at lower cost and without usual danger to the operator.

Send a sample scale-covered part with a letter describing your problem. Liquid Honing engineers will remove the scale and return the part with their recommendations. No cost to you . . . no obligation.

VAPOR V-B BLAST MILWAUKEE, WISCONSIN

*Liquid Honing and Vapor Blast are trademarks.

DOLLAR FOR DOLLAR, JOB FOR JOB, NO OTHER SURFACE-CONDITIONING METHOD CAN EQUAL LIQUID HONING

VAPOR BLAST MFG. CO.

3131 WEST ATKINSON AVE. • MILWAUKEE 9, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 61

Call Pioneer now...

Why worry about where to find competent designers and engineers of dies, fixtures, tools and gages.

Pioneer has them for you.

Our highly skilled tool designers and engineers are the permanent solution to engineering overloads in many tool and process engineering departments like your own.

They will be ready to go to work *when and as you need them.* Eliminate worry about temporary overloads and excessive payrolls. Call Pioneer headquarters now.

SINCE 1931 **Pioneer ENGINEERING & MANUFACTURING CO., INC.**
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INDUSTRIAL ENGINEERS, CONSULTANTS & DESIGNERS
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CIRCLE INFORM-A-GRAM KEY NO. 62

. . . TADMU from page 60

ment include elimination of drilling or welding any of the attaching members during installation, complete adjustability of members, permitting the replacement of individual components and subassemblies without disturbing the entire unit. The friction-clamp supporting the cathode assembly can be adjusted easily to move the cathode rail up or down, in or out, or tilted in relation to the true vertical — which permits establishing ideal contact between the shoe of the carrier and the cathode rail surface.

Importance to plating equipment users are some of the new concepts of component design resulting from the day-to-day study of the working mockup. These already are making possible floor space and chemical savings, and overcoming plating operation drawbacks such as work banging together in plating tanks, hangups, and bath contamination.

One development supplies a real key to the whole modular construction principle: The elevator mechanism permits the location of elevator stations at regular, fixed intervals throughout the length of an overall machine, rather than at varied locations governed by tank transfer operations, as required in most conventional machines.

A further development which resulted from Wagner's mockup is a special compensating assembly. This makes possible the spacing of work racks within multiple-station tanks at intervals which give maximum operating efficiency without impact.

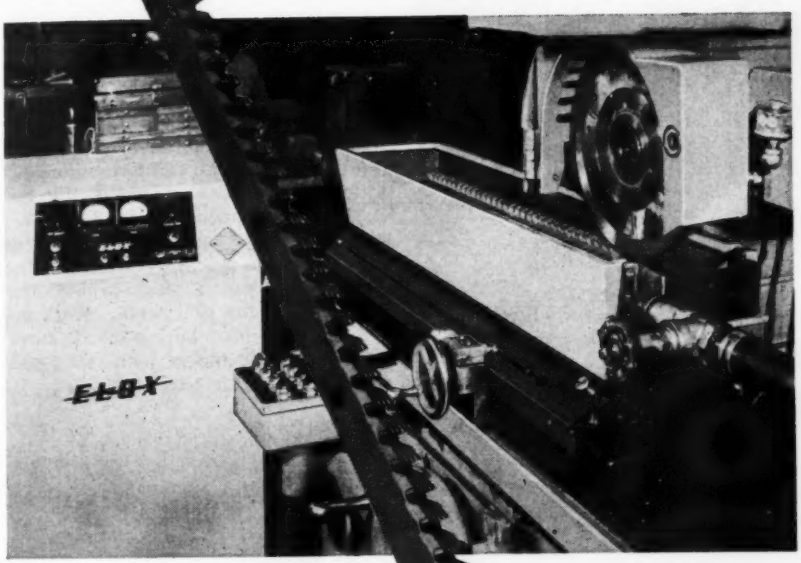
Another important development resulting from mockup testing is the use of ball bearings, rather than cylindrical rollers to support the plating machine carriage. The principle eliminates many disadvantages normally associated with rollers — for instance, lower side bearings to keep the carriage base in line, oil-filled center trough for adequate lubrication, end-wear on rollers requiring periodic adjustment in service, and power lost in overcoming friction-drag of rollers.

The ball bearings offer smoother carriage action, provide an inherent clearance take-up feature, help keep the carriage automatically centered and adjusted relative to the center line of the machine.

Moreover, by using soft, cold-working steel for the V-grooved tracks, the balls brinnell two narrow grooves in each of the tracks in a manner which automatically com-

. . . *Continued on page 64*

"elox saves us $294
...8 operations
form grinding this broach"
Ford Motor Aircraft Division



Savings on preformed carbide blanks	$ 32.00
Omitted operations savings	120.00
Diamond wheel savings	142.00
Sums up to	$294.00

The Job...
Broach, used for broaching the pine tree form on turbine blades of the J-57 Jet engine.

NO DIAMOND WHEEL...

EDM substitutes inexpensive brass wheels costing less than $45 for expensive diamond wheels costing a minimum of $150. Brass wheels are formed for $1 as against a diamond wheel contour forming cost of $35.

NO PREFORMED CARBIDE BLANKS...

Conventional machining necessitates preformed tungsten carbide and preformed steel shanks. EDM machines the carbide, brazing material and steel simultaneously, and requires no indexing to assure a perfectly formed broach as to location and size.

OPERATIONS...

Conventionally machined, the pine tree broach requires 22 operations. EDM does it better in 14.

Electrical Discharge Machining has reduced the machining time of this intricate form in 32 carbide tipped teeth to a total time cycle of 33 minutes . . . one-half the time of abrasive grinding. Tolerances held to: +0, —.0002".

elox corporation of michigan *T.M. Reg.

1834 N. STEPHENSON HWY. • ROYAL OAK 3, MICHIGAN

EDM keeps you ahead of competition • Grinding • Die Sinking • Form Grinding • Single Point and Insert Tool Sharpening

CIRCLE INFORM-A-GRAM KEY NO. 63

he HAD to use a cutting torch

but YOU can use a Buckeye Air Tool!

Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

Cutting irregular shapes in metal can be a very difficult job that requires a cutting torch, or at best, a whole series of drilled holes, plus some grinding and filing. On the other hand, you can clean up the job with neatness and dispatch by simply using a Buckeye air-powered nibbler. This tool makes a sharp, clean cut, free from distortion, in sheet metal, steel, plastics, etc. Starts anywhere on the workpiece, goes anywhere you want it to, even in corrugated material or tubing as small as 1 ½" diameter. Catalog A-10 tells all; write for your copy.

In Air Tools, Your Best Buy Is Buckeye

Buckeye Tools CORPORATION

DIVISION 19 • DAYTON 1, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 64

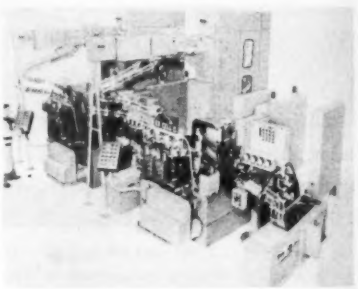
. . . TADMU from page 62

pensates for minute irregularities in the base of the machine transmitted from the machine foundation contour. These track grooves soon acquire a mirror finish, and become work-hardened by the rolling action of the balls. Balls are of stainless steel and roll in a "spiral" path to prevent the formation of flat spots.

SPECIAL GEAR MACHINE HAS AUTOMATIC TOOL ADJUSTMENT

An automation line recently set up for producing steel gears in an automobile plant includes two standard cam-operated precision boring machines. These machines incorporate not only automatic work handling equipment, but also automatic tool adjustment controlled by air gages to compensate for tool wear.

Operations on these Ex-Cell-O Corporation machines consist of finishing the entire blank prior to the cutting of the gear teeth. Work includes precision boring the ID, turning the OD, facing both sides, and chamfering the edges.



Parts are gaged before and after each operation. The first gaging is a check to prevent oversize parts from entering the machine, and such parts are rejected automatically. When the work leaves the machines, the blanks are gaged again; and, as dimensions approach minimum or maximum limits, the tools are adjusted automatically through electrical impulses from the gages.

Either machine can be shut down for changing tools while the other continues to operate. This is made possible by the use of two storage-distribution units, each of which is capable of storing hundreds of parts and releasing them as required to the following machine.

Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of
Carbide Dies

"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut

"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U. S. A., $6 elsewhere.

Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

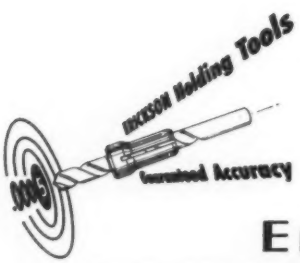
ERICKSON INDEXERS–

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment – all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



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AA-2237

CIRCLE INFORM-A-GRAM KEY NO. 66

A Matter of Good Will

IS WAR NECESSARY to demonstrate the essentiality of Small Business? In the main, Small Business is that vast network of roots, capillaries, and feed lines that enables Big Business to be big.

In other words, the ideal relationship of Small Business to Big Business is that implied by the old military term, SOS — Service of Supply.

Today, in too many instances, the term SOS can be applied to Small Business in the sense that it (SOS) is the internationally-established distress signal; a call for help. This situation is far from ideal, and hardly one to engender the good will so desirable within the fabric of our free-enterprising economy.

Here, there, and around the corner, we hear of instances of small shops losing business, to the point of threatened extinction, due to big companies taking work back into their own departments. This can leave the small shop proprietor, with his skills and enviable low overhead, stranded or sunk without a trace.

Let's think this through in terms of that priceless commodity — good will.

Assume that the big company is the manufacturer of the highly advertised line of Wonderful Waterless Washers, and that our small shop has been kept busy stamping out lid latches for the WWW. Assume further (and safely) that our small shop proprietor has the standard quota of brothers, sisters, children, nephews, nieces and in-laws, all members of congenial (and talkative) groups in their respective communities.

When word gets around that Uncle Jim had to shut down his presses because the WWW Co. decided to make their own latches, how many full pages of Saturday Evening Post advertising would it take to sell WWWs to that otherwise friendly group of prospects?

As a consequence of a move that might have been avoided, Uncle Jim has to beat the bushes for replacement business, the WWW Co's market analysts fall on their faces, and a lot of good will goes down the drain.

Let's take a look at an opposite picture. We are all familiar with recent display ads run by General Motors. These feature case histories of how small, one-man and one-famiy businesses have, by virtue of ingenuity and enterprise, become suppliers to General Motors. The good will that is generated in those family circles and neighborhoods toward General Motors is both priceless and incalculable.

It's a lot easier to lose good will than to gain it. It takes steady, consistent, well-directed effort on all fronts to gain good will for a company's name and product. Losing it is as easy as falling off a log.

The vast majority of our Small Business shops and enterprises are peopled by conscientious, skilled, and ambitious proprietors and workers. Given a job of work that they can get their teeth into, they will improvise, make-do, and deliver; at a competitive price, with a modest profit to themselves, and with gratitude.

Admittedly, they are not the prime market for automated production lines, but given any encouragement in the way of new and prospective business, they are the boys who will step forward as prospects for individual, numerically-controlled machine tools. Then, when they get a repeat order for a modest hundred pieces to be automatically milled, ground or turned out on a turret lathe, they will step to a file drawer and get out the punched card or tape that carries the necessary job instruction, operations, dimensions, and skills, as recorded when the first batch was run.

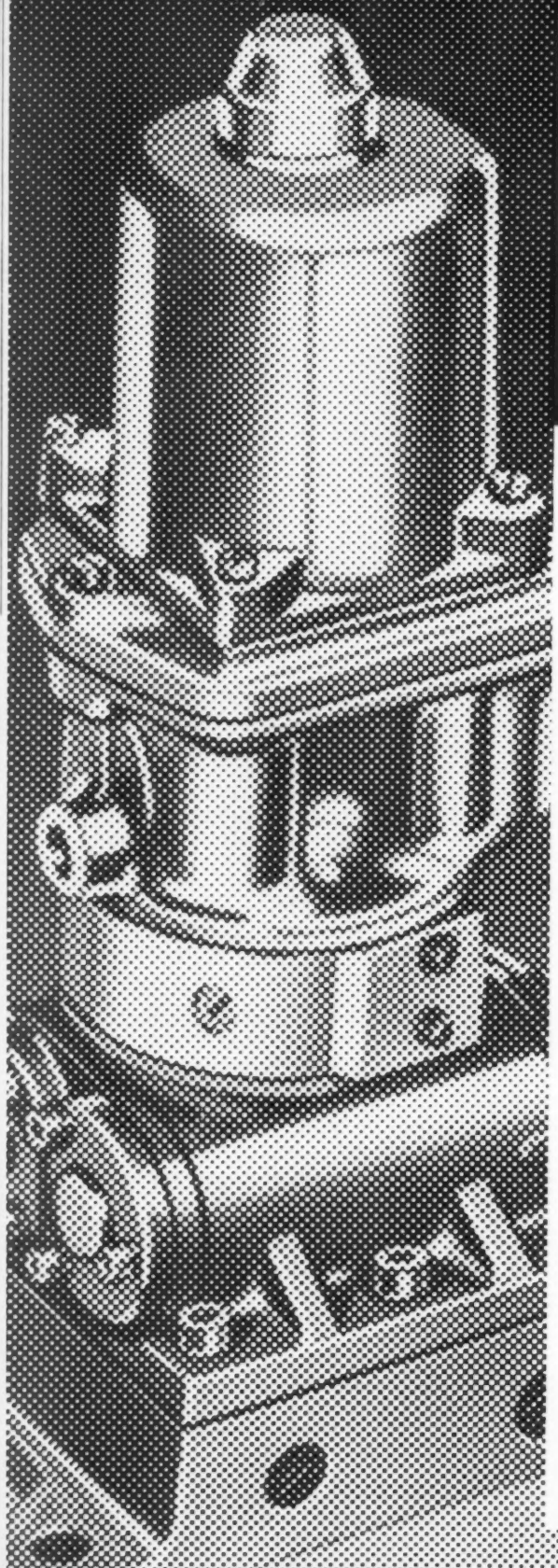
If Big Business will exercise its full and potential responsibilities to the sustained sucess of our (and its) economy by recognizing and utilizing to the utmost the skills, versatilities, and ambitions of Small Business a well balanced economy can be assured.

By pursuing this course, Big Business can enjoy freedoms over and above those guaranteed by our Constitution, i.e., freedom from accusations of bigness, freedom from govenmental domination, and freedom from the consequences of ill will in the market place.

The most profitable deal possible in a free enterprise economy is when any threat of ill will can be traded for the assurance of good will.

E. Willard Pennington

editor



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CIRCLE INFORM-A-GRAM KEY NO. 68

TOOLING & PRODUCTION

Stamping plant procedures, followed in meeting development problems, usually vary from plant to plant in

MAKING METAL BEHAVE

by Carl F. Benner
Associate Editor

EXPERIENCE HAS DEMONSTRATED that each new job accepted for production in a stamping plant presents an individual development and press problem. The approach to these problems vary in procedure from plant to plant.

To determine what some of these specific problems are and how they are solved, interviews were arranged with the operating engineers in a number of Cleveland area stamping plants.

The type of press equipment found in a stamping plant will determine to a certain extent the scope of work that the plant can accept and produce satisfactorily. This means that on the average, stamping plants specialize in light, medium, or heavy work.

Accepting the fact that each new job that is entered in a stamping plant constitutes a development project and presents certain problems, we find there are different approaches to starting a development job. However, the first step ordinarily would be to determine the maximum pressure required to perform the operation. From this value a press with sufficient capacity can be selected for the job.

Here again there is a variation in the procedure for arriving at the required press tonnage and selection of the proper press. Depending on the operation to be performed; that is, blanking, piercing, forming or drawing, there are formulas available for each of these operations. Factors that must be known to substitute in these formulas are: diameter or perimeter of the part, stock thickness, and shearing strength in terms of pounds per square inch if the die has been built with shear.

Instead of using formulas, some engineers use the Crary Press Calculator for computing press tonnage. The same data used in computing formulas is required in working the calculator, and those using it find it accurate and a time saver. It was developed a number of years ago by Leonard R. Crary, M.E., a staff engineer for the E. W. Bliss Company.

PNEUMATIC DIE CUSHIONS are widely used throughout the stamping industry, particularly on drawing jobs to be performed on single action and double action presses. The problem presented here is the prevention of wrinkling on the one hand and tearing of the metal on the other. Wrinkling in the part is caused by insufficient pressure being exerted by the draw ring on the metal as the punch forces the metal into the die. Tearing of the metal results from the applied pressure on the draw ring being too great.

Some of the press manufacturers such as Bliss, Danly, Verson and others make die cushions available with their presses and provide manuals which include tables for determining tonnage capacity of cushions of various cylinder dimensions.

The forerunners of the pneumatic die cushion were spring and rubber bumper accessories

for presses. The development of the pneumatic die cushion was prompted by the lack of uniform pressure obtainable in draw work on presses equipped with the spring or rubber bumpers. The experience was that the pressure was either insufficient, allowing the metal to slip and cause a wrinkling in the part, or too much pressure causing the metal to tear. Adjustment of pressures under these circumstances were difficult to make and often inadequate.

To avoid the possibility of wrinkling or tearing a drawn part, it is necessary to accurately determine the holding pressure exerted on the draw ring.

Rules for finding die cushion size and ring-holding pressure required, when dimensions of the first drawn shells are available, have been developed by the Dayton Rogers Manufacturing Company. These rules, table of constants, and an example showing the procedure for determining cushion tonnage are given:

1. To obtain the correct draw-ring holding pressure for the first draw on a round or irregular shell of one operation or more, the circumference and thickness of the first draw are required.

2. To find the size of the cushion and draw-ring holding pressure required, proceed as follows:

Multiply the circumference of the first draw by the constant in Table A corresponding closest to the thickness of material to be used. This constant represents the number of pounds of ring-holding pressure required per inch of circumference at the drawn diameter. The result will be the ring-holding pressure in pounds required by the pneumatic die cushion to draw the given shell.

Table A

Stock Thickness	Constant (Pounds required per inch of circumference)	Stock Thickness	Constant (Pounds required per inch of circumference)
0.010	820	0.060	546
0.015	788	0.065	524
0.020	757	0.070	503
0.025	727	0.075	483
0.030	698	0.080	466
0.035	670	0.085	448
0.040	645	0.090	431
0.045	618	0.095	415
0.050	593	0.100 and over	400
0.055	569		

Next, select a pneumatic die cushion from cushion specifications that will develop this ring-holding pressure. By taking the ring-holding pressure required and dividing by the area of the piston, the result will give the shop air-line pressure required on the pneumatic die cushion to develop this ring-holding pressure. If the air pressure required is higher than what is available from the shop air line, a larger cushion or a high-pressure model must be selected in order to develop the required ring-holding pressure.

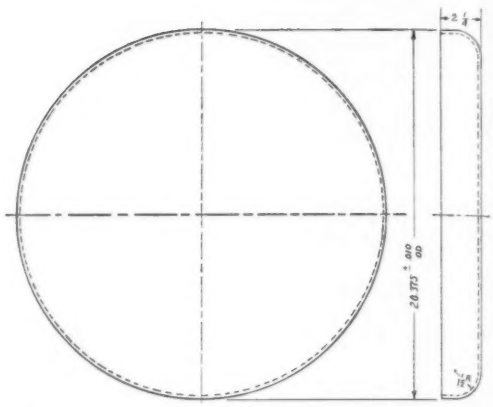

Fig. 1. Wrinkling difficulties experienced in drawing this cover on its initial run were caused by the inability to properly adjust the press pressure springs.

Constants for the various thicknesses of stock are as follows:

Example: On a shell 4″ in dia whose stock thickness is 0.050″, the circumference is approximately 12″. From the table we find that 0.050″ stock requires 593 lbs ring-holding pressure per inch of circumference. By multiplying this figure by the 12″ circumference, the ring-holding pressure required will be 7,116 lbs or approximately 3.5 tons, which is to be supplied by the pneumatic die cushion.

From cushion specifications we find a 12″ pneumatic die cushion has a ring-holding capacity of 5.7 tons at 100 lbs pressure and a piston area of 113 sq in. Thus when the 7,116 lbs ring-holding pressure is divided by the number of sq in in the piston, the resultant figure will give the air pressure required, which will be 63 psi. If this pressure can be supplied, the cushion is suitable for drawing the shell satisfactorily. However, if 63 lbs line pressure is not available, it will be necessary to select a larger cushion, which will develop the required ring-holding pressure on the amount of air line pressure which can be supplied.

After a suitable cushion has been selected, the over-all dimensions of the cushion should be checked with the press bed to determine if it will fit satisfactorily. If not, it will be necessary to use a tandem type cushion. In general it is good practice to equip the average press with a cushion having maximum ring-holding pressure of one-sixth the total press tonnage. However, where the press will be subjected to complicated draws, a ring-holding

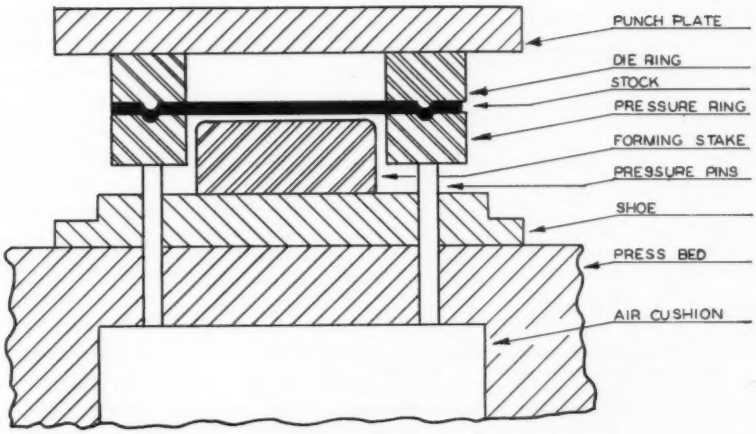

Fig. 2. A schematic view of a drawing die showing a pressure ring machined into the draw ring.

pressure approaching one-quarter of the press tonnage should be considered.

The procedure followed in one plant, that specializes in complicated development work, is to build a soft steel die based on the blue print dimensions of the part to be fabricated. A blank of approximate shape to form the workpiece is cut and tried out with the soft steel die. This cut and try process is continued until a blank is developed that when formed in the temporary die produces a part that meets the specifications and tolerances. Using this try-out die and blank as patterns, a forming die to produce the part and a die to stamp the blanks are then made. This method of developing a production die has proven to be satisfactory to the point of becoming a company policy with the concern mentioned.

A BAFFLING PROBLEM WAS ENCOUNTERED in one plant that was easily solved when the cause of trouble was uncovered. A job of drawing compressor shells was being processed on which certain dimensions had to be held to $\pm 0.002''$ tolerance. On the first run, these tolerances had been held without difficulty. However on a re-order of this job, washing between draws was necessary. For some reason the $\pm 0.002''$ tolerance could not be held consistently on the succeeding draws after washing.

The procedure in handling the parts after the washing operations was to load them on a truck as they came from the wash, where they were piled in tiers of considerable height. When loaded, the truck was transferred to the next press for the subsequent draw. It was finally discovered that those parts which had been on the bottom tier of the truck and had cooled to room temperature came out of the draw operation within the specified tolerance, while those from the upper tiers, that were still hot from the wash, were out of tolerance when drawn. When it was discovered that this variance in temperature of the parts was causing the trouble, the solution to the problem was simple. They simply held the loaded truck of parts until they all cooled to room temperature before going to the next drawing operation.

This experience does not necessarily mean that all wash and draw jobs should be allowed to cool to room temperature between draws, but it suggests a simple solution to what was a troublesome problem.

SEVERAL INTERESTING CASE HISTORIES were encountered in a plant that is equipped to produce a wide variety of work. Both cases are somewhat similar drawing jobs but the final setup was different for each one.

The part shown in Figure 1 serves as a cover for a container. Considerable difficulty was experienced with the material wrinkling on the draw when this job was first started. At that time the press used was equipped with adjustable springs to apply pressure on the draw

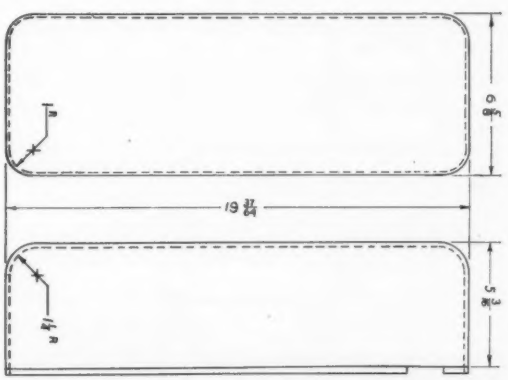

Fig. 3. An oblong cover on which a pressure ring was not the answer to preventing wrinkling of the part while drawing. Proper shape of the blank was the solution to the problem.

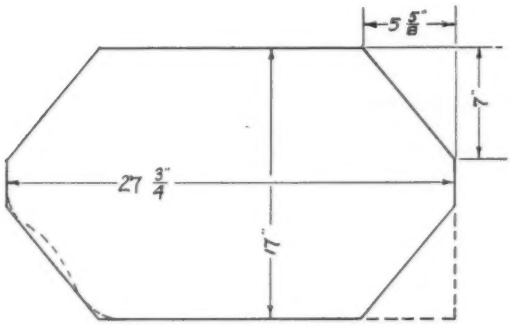

Fig. 4. Starting with a rectangular shaped blank, excess metal in the shape of triangles was cut off from the corners. This removed the metal that could not be crowded into the die without forming a wrinkle. The dotted profile line represents the general practice for handling this type of problem, but on this job the straight line cut solved the difficulties and also saved building a special die for stamping a profiled blank.

ring, but the proper pressure could not be attained to eliminate the wrinkling condition.

The wrinkling problem was solved by putting a pressure ring in the draw ring as shown in the schematic drawing in Figure 2. This ring consisted of a groove machined in the die portion of the draw ring and a matching convex ring machined on the punch portion of the draw ring. However, it does not make too much difference in the final results if the positions of the groove and convex rings are reversed.

As can be seen in Figure 2, the stock is gripped by the pressure ring with just enough pressure from the air cushion to hold it, and at the same time allow the stock to slip slowly as the ram descends — forcing the material into the die to make the draw without any wrinkles.

Several re-orders for this part have been received yearly for about nine years, and the same die, with the pressure rings cut in the draw ring, still serves to produce the covers. The die can be set up in any available press of sufficient tonnage to run the job.

Because the covers on this job have to have a uniform edge, it is necessary to perform a secondary trimming operation. Therefore, the blanks are stamped to a sufficient size, so that they are not drawn completely through the pressure rings, at the end of the ram stroke. However, if the edge of the part does not have to be uniform, and no trim is required, then the blanks can be cut to such a size that will permit the blank to be pulled through the pressure ring at the end of the ram stroke.

The other job of interest was also a draw job on which the pressure ring method did not work. This part was also a cover, but of rectangular shape with slightly smaller radii on the bends as shown in Figure 3. Although an air cushion was used on the press, the full rectangular blank gave too much material at the corners to crowd into the draw without wrinkling the part on the corners.

On this particular job the development work centered on determining how much material should be removed from the corners of the blank and whether the removed portion should be profiled or just triangular pieces as shown in Figure 4. The dotted line indicates a typical profile pattern that could have been used. However, it was found that from the blank with triangular shaped pieces removed (Fig. 4) satisfactory covers could be drawn. This simple straight line cutting simplified blank production, whereas, if the profile shape had been required, it would have meant the building of a special die to make the profiled cut.

A PLANT THAT IS EQUIPPED with a wide variety of presses ranging in tonnage up to 500 tons has developed a system of analysis

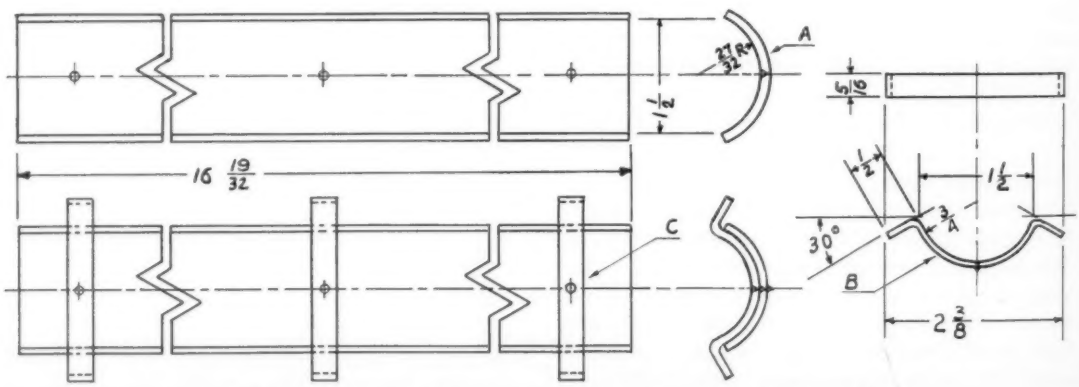

Fig. 5. Drawing shows a baffle design, at the top, to which 3 brackets, right, were to be spot welded. The lower view shows the baffle and 3 brackets assembled by spot welding.

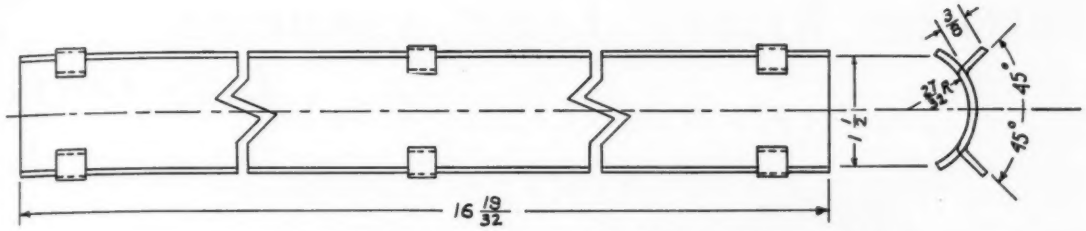

Fig. 6. The redesigned part shows 6 portions of the baffle body notched and bent to a 45° angle, thus making the brackets integral with the baffle.

for all job proposals. This analysis is made to assist in determining whether the job can be produced on their existing equipment and as a guide in preparing a quotation.

The steps followed in the analysis are as follows:

1. Can the part be simplified and be functionally the same?
2. Can any operations be combined?
3. Can pierced holes be combined with trimming?
4. Can the part be run economically in a progressive die?
5. Can the part be made economically from strip stock as against sheet?
6. Quantity required? This is to determine whether stock tooling or special dies will be required.
7. Can several large dies be combined in a press, such as draw and trim, to reduce floor to floor handling time?
8. Would job be run with an automatic or manual feed?
9. Can left and right parts be made in same die?

A striking demonstration of product design simplification is shown in Figure 5. The original design for baffle and bracket units showed a semi-circular part (A) to which 3 brackets (B) were to be spot welded (C). The dimples shown in the baffle and brackets were intended for locating purposes during the spot welding operation.

In the simplification of this design, the separate brackets were eliminated but were substituted by shearing six small sections of the baffle body at the desired locations and bending them to an angle of 45° as shown in Figure 6. If this baffle and bracket had been made according to the original design, it would have required a die to form and dimple the baffle; and another die to form and dimple the bracket pieces.

Assembly of the unit would have consisted of locating the bracket pieces in the baffle member by mating the dimples of each part in preparation for two spot welds in each bracket.

If sheet stock had been used, steel for the baffle part would have had to be sheared to size as well the three bracket pieces for each unit. However, use of strip stock would have eliminated these shearing operations.

A material handling operation would also have entered into the spot welding requirement, because the parts would have had to be transported to the spot welding department for assembly.

As a result of the product design simplification a form and shear die was developed. With this die, one hit of the press ram formed the baffle and sheared and bent the brackets to the required shape, thus making the brackets integral with the baffle as shown in Figure 6.

Although there are formulas, charts, and calculators available for solving the mathematical aspects of the production engineer's development and press problems, his experience is his stock in trade. His approach to any new job is "How can this part be simplified so that it can be produced at the lowest possible cost to our customer?"

Some of the long established companies have accumulated a large stock of dies. It is possible at times to assemble several of these old dies to conform to the shape of the part to be stamped. This of course saves the cost of a whole new die and can be credited to the experienced production engineer.

Whether or not a die tryout press is part of a plant's equipment, it is more or less general practice to make the final tryout of the die on the press on which the run is to be made.

end

Acknowledgments

The procedures and experiences related here have been gathered through the courtesy of the following companies:

American Stamping Company
Hupp Corporation
The Geometric Stamping Company
Dayton Rogers Manufacturing Company
The Brandes Press Company
E. W. Bliss Company

PRECISION WELDING LARGE ASSEMBLIES . . . CUTS COSTS

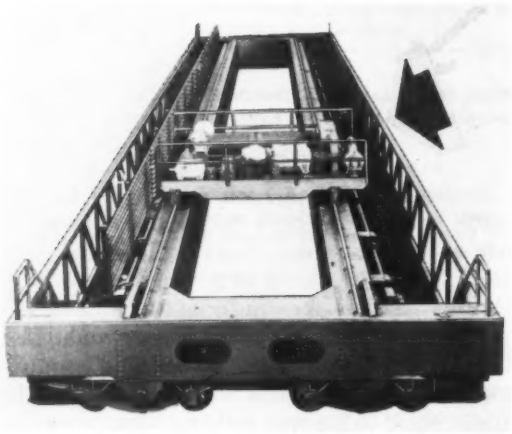

Fig. 1. The trolley frame (arrow) carries the crane's hoisting unit across the crane bridge.

IMPORTANT SAVINGS IN MACHINING TIME on large assemblies are being made through precision welding. In fabricating 20-ton trolley crane assemblies for huge mill cranes at the Shaw-Box Crane Division of Manning, Maxwell & Moore, for instance, the key to welding accuracy and savings is the use of a Challenge precision surface welding table. With this equipment, the position of the critical parts can be held to several thousandths of an inch. The result is the elimination of difficult and expensive subsequent machining operations.

The 12′ x 20′ precision welding table they use consists of four separate 5′ x 12′ plates which are keyed and bolted together and mounted on a special stand. The surface accuracy of each section is within 0.002″ with an overall accuracy over the complete plate of within 0.005″.

Key slots in the table provide a means to hold the work in place. At Manning, Maxwell & Moore, special T-slots are also provided in the sides of the plate to hold fixtures in place when jobs overlap the side, as they do on the job shown above. Scribe marks are also provided at regular intervals in the plate at right angles to the T-slots as an aid in positioning the work.

The Muskegon, Mich., firm holds the assembly accurately in position on the welding table with a series of fixtures, and then tack welds the parts into place. The assembly is then placed into an oven and baked to relieve the stresses, and then returned to the welding table for final welding. The trolley crane job is built up as a series of sub-assemblies which ultimately are precision welded together as a complete unit. This particular unit carries the crane's hoisting equipment and moves back and forth across the crane bridge so it is important that the pads, which take the bearings on which the mill trolley moves, are held accurately in place during welding operations so subsequent machining operations can be eliminated.

The only special requirement for welding the assembly in this manner is the development of special fixtures for holding the work in place. M, M & M feels that the saving in machine set up and machining time more than offsets the cost of the fixtures.

The precision welding table is also used by Manning, Maxwell & Moore as a reference in periodically inspecting the welded pieces throughout the manufacturing process.

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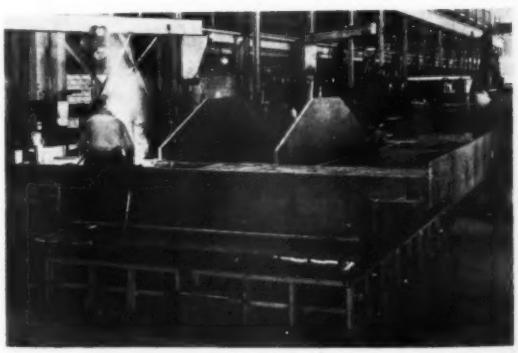


Fig. 2. The trolley frame for a large mill crane is positioned on a precision surface welding table to assure welding accuracy.

Universal Drill Jig Simplifies Complicated Drilling Operations

SIMPLIFICATION of the present day drilling practices is found in the facilities offered in the design, construction, and accessories of the Reglus universal drilling jig. Drilling accuracies are possible that are only obtainable with a special purpose jig.

In the use of this jig, the measuring, straightening and trial-drilling operations ordinarily necessary, the marking-out and center-punching of the work, and the production of expensive special-purpose jigs are all dispensed with.

The jig may be set directly from blueprint dimensions by means of two verniers and adjusting screws, and can be adapted to any individual drilling job in a matter of seconds. Most drilling problems can be solved that are within the limits of the jig's clamping capacity. It is immaterial whether the workpiece is of cylindrical, square, rectangular, multi-angular, spherical or flat cross-section, or whether the work consists of making complicated serial or eccentric drill-holes, or drill holes at specific angles.

Among the accessories furnished with the jig are: 16 bushings, drill hole diameters ranging from 0" to ½"; vee-block for offset holes; vee-mounting for small workpieces; mounting for spherical workpieces; drill table for flat, offset, or small workpieces; fixing attachments for holes at predetermined intervals; angular drilling attachment; and mounting for hexagons.

Recently, several Reglus drill jigs were installed in the drill press department of The National Acme Company. From their experience with these jigs, they have accumulated case histories of considerable interest, several of which will be briefly described.

The method for setting up the jig on a turret drill press is shown in Figures 1, 2, and 3. These show the right side, front, and left side views respectively of a taper-handled spanner wrench set up in the jig. The centerline of a hole through the offset end of the wrench has to be at right angles to the centerline of the handle. The adjustability of the offset holes "vee-block" facilitates the setup for this type of operation.

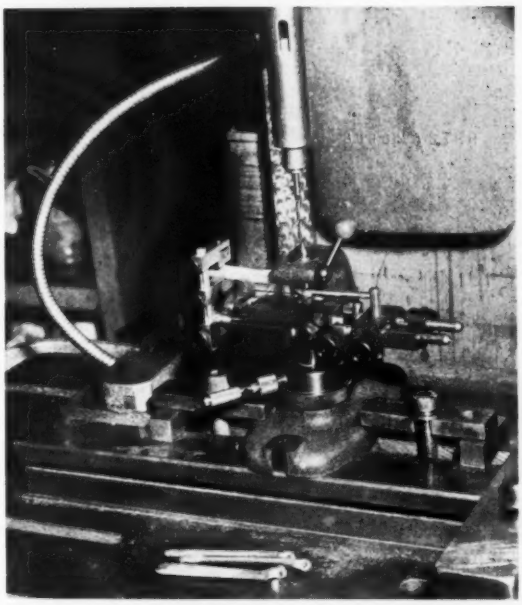


Fig. 1. The Reglus drill jig is shown set up on a turret drill press. A taper-handled spanner wrench is mounted in the jig, ready for drilling a small hole in the offset end. The centerline of the hole must be perpendicular to the centerline of the handle.

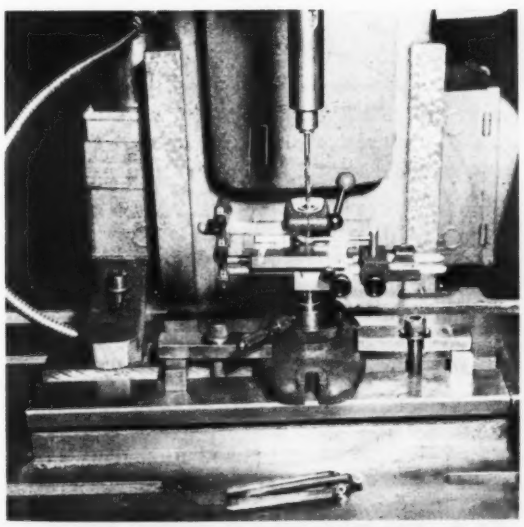


Fig. 2. Front view of setup as shown in Figure 1.

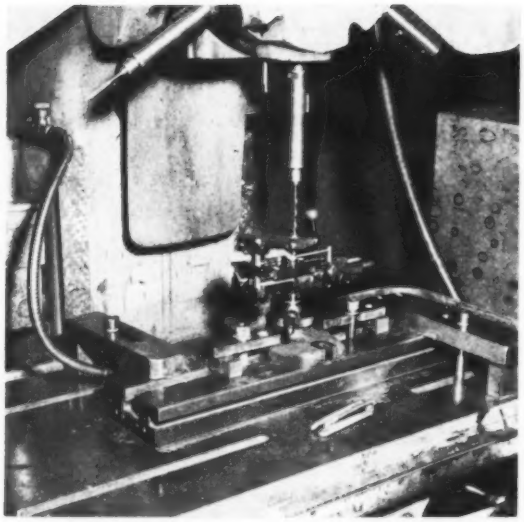


Fig. 3. Left hand view of setup shown in Figure 1.

The specifications for the 1.250" brass ball shown in Figure 4 called for machining a ⅛" section from the top of the ball; drilling and tapping a ½" — 13 hole centrally located in the flat surface.

In preparing for this job, the "spherical workpiece mounting" was set up on the jig and locked. Then the ball was set in the mounting and clamped.

The operations were:

1st. Milling off the ⅛" section with a ¾" flat bottom end mill.

2nd. Drill center spotting by a ¾" drill point.

3rd. Drilling hole with a $^{27}/_{64}$" tap drill.

4th. Tapping hole with a ½" — 13 tap.

The end mill, drills, and tap were set up in the spindles of the six-spindle turret drill press

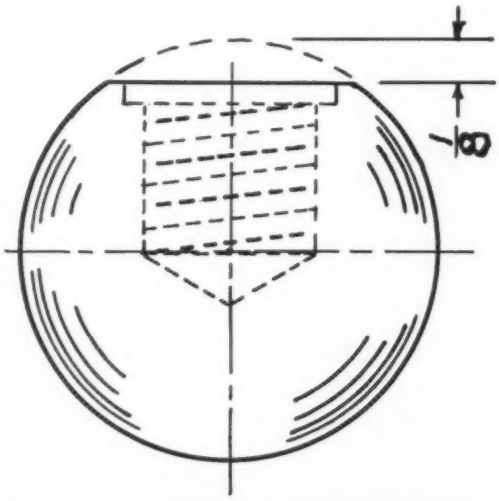


Fig. 4. Brass ball on which all operations were performed while held in one position in the jig.

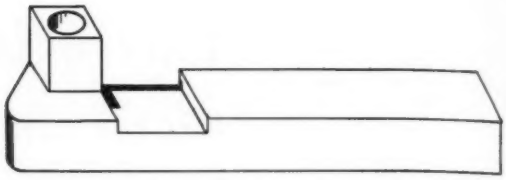


Fig. 5. Workpiece on which a difficult drilling operation was facilitated by use of the Reglus drill jig.

and were indexed in succession for each operation.

On this job the initial setting of the ball was not disturbed during the four operations, thus insuring the machining accuracy required. The simple means of clamping the workpiece makes possible repetitive operations with assurance of accuracy.

Previously this machining job had been performed on a hand screw machine, during which the ball was held in a collet for the machining operations. However, it has been possible to do this ball job faster and with the required accuracy, by use of the Reglus drill jig.

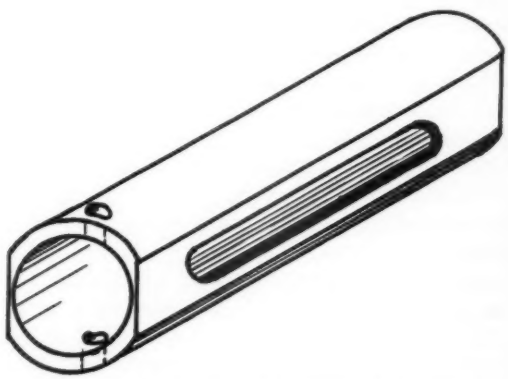
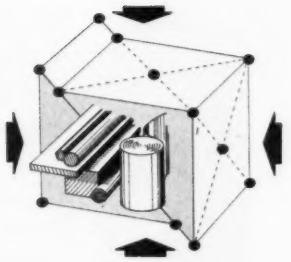


Fig. 6. This tubular workpiece presented the problem of drilling a 3/32" hole through both walls parallel to flats machined on opposite sides of the tube.

The part shown in Figure 5 was a difficult workpiece to locate for drilling the ⅜" hole without a special jig because of the offset portion of the part. However, by use of the drilling table for flat, offset, or small workpieces when mounted on the jig, this operation was simplified.

The 1" tubular part, with ⅛" wall thickness shown in Figure 6 has ½" wide flats machined on opposite sides of the tube and a ¼" slot cut in the center of these flats. The problem in this case was to drill a hole through both walls of this tube, whose centerline had to be parallel with the surface of the flats. By using the regular jig vee-block in combination with the small workpiece "vee-mounting", the job was performed without difficulty. end



'IRONING' TO IMPROVE YOUR PRODUCT AND SAVE . . . Metal, Time, and Money

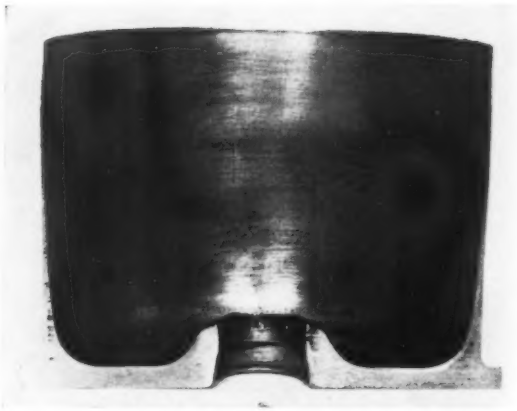
by Carter C. Higgins
President
WORCESTER PRESSED STEEL COMPANY
Worcester, Massachusetts

When "drawing" metal from a blank, or when a previously drawn cup is to be further reduced, the punch is made to a size that will allow the drawn part to be between the punch and the die *without* undue crowding. When "ironing", an interference is arranged so that the part *will* be crowded and actually ironed (by a shearing action) to a new thickness, the new wall thickness being determined by the clearance between the punch and the die.

IRONING SAVES MONEY in that the operation replaces machining. Less metal is used since it is repositioned rather than removed. And the operation is quicker than if chips were to be made. Although ironing is frequently used in the press forming of metals, available information on the process is sketchy. The intent of this paper then is to provide a better understanding of the ironing process.

An ironing operation may be defined as one where the clearance between the male punch and the working female die is less than the thickness of the material which the punch draws or forces between them. When this difference in thickness is only a few thousandths of an inch the operation is frequently referred to as sizing, although ironing takes place.

Ironing is used a great deal if you are drawing pressure cylinders. Here the tubular walls can be thinner than the flat end and still resist the same pressures. In an example of a cartridge case, it is desirable that the walls expand when fired to fill the gun chamber. This takes place when the walls are thin enough to move, and yet the base of the case must be heavier so as not to distend. This thin wall, heavy base, part concept can be accomplished by the quite different processes of backward (or impact) extrusion, and forward (or Hooker) extrusion, but both these processes require extremely heavy pressures, and any slight defect in the die surface is picked up and enlarged on the surface of the final product. Also die alignment is critical, and more difficult.



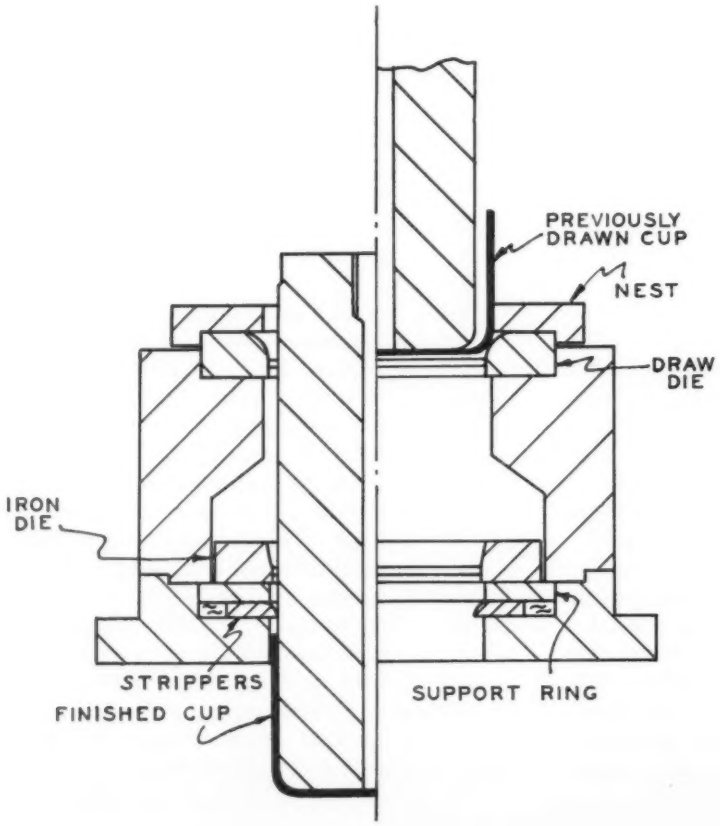
An excellent example of a thin wall, heavy base, part.

CLOSE TOLERANCES AND SURFACE FINISHES can be had as the peripheral pressure inherent in ironing forces the cup to hug the punch tightly. It is therefore possible to attain inside diameter tolerances of 0.002″ to 0.004″. The metal ironed is highly burnished and consequently very smooth — around 20 microinches. Such a surface requires careful lapping of the die parts in the direction of flow of the metal being ironed.

A cup, *drawn* with normal clearances will have the original metal thickness about halfway down the cup. However, the thinned radii from previous draws and the stretching action of the punch particularly in starting the draw, tends to reduce the metal gauge around the closed end. At the open end, the metal on the outer circumference of the original blank has flowed into a much smaller diameter under compression. This may be 10% to as much as 25% heavier than its original thickness on titanium alloys. Such variations are sometimes troublesome and can be corrected by ironing to achieve a straight walled cup.

A deep drawn part usually has a slight outward taper on the inside wall. At Worcester Pressed Steel we like 0.001″ taper for each inch of height if we can have it. Although we have drawn cups 14″ deep with a 0.001″ total taper, the stripping was a real problem. In precision work, however, tapers of this magnitude are rarely encountered.

To maintain thickness in the lower portions of cups, especially in drawing such materials as oxygen-free copper, pushing operations are used. Here the punch is only used to set the inside diameter, and a ring comes down around the punch to push on the open end of the cup, forcing it through the die. This ring does the work rather than the punch, and actually forward extrudes the metal ahead of it. The cup



Shown here: A two stage die where drawing takes place in the upper stage, as seen on the right. Ironing is done in the lower stage, as seen on the left.

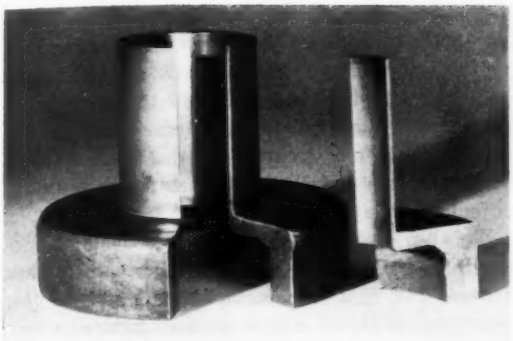


Figure 1

bottom moves ahead of the punch into the die so that it isn't stretched thin by the punch.

SOME MATERIALS IRON MORE READILY than others. Stainless steel for instance, is most difficult to iron; it work hardens rapidly and tends to gall rather than burnish. Although reduction may be small in ironing hard metals, for close inside diameters and straight walls preparatory to grinding, success may be had with carbide dies.

In making brass cartridge cases, you may thin the wall about 40% of its original thickness in one operation. Aluminum also irons well. Some refer to 10% or 12% as practical reduction limits for low carbon steel. The trend, however, is upward to reductions twice as great as this. Theoretically, balancing stress and strains implies a limit of 50% before anneal.

PREREQUISITES FOR SATISFACTORY IRONING are:
1) Cups to be ironed should be reasonably uniform, although no trouble arises in ironing raw material purchased with a mill tolerance of ±0.008"; thickness variations will be concentrically distributed. 2) The ironing die must be carefully set perpendicular to the travel of the punch. 3) The cup must be reasonably soft, depending on the reduction, and well lubricated. 4) The die itself must be heavy enough to withstand substantial radial stresses. 5) Press speeds should be slower than those used for drawing. 6) Hydraulic presses are preferred for a smooth continuing action. 7) The diameter of the cup should be slightly larger than the diameter of the punch so that the punch can enter freely.

DIE CONSTRUCTION IS IMPORTANT; it should be such that a cup will ride smoothly past the ironing portion of the die. If the part must be brought back up through the die for stripping, the maintenance of the die will be

Figure 2

higher than if the part passes through and is stripped off below. The ironing die itself should have a bevel of 15° from the perpendicular at the entrance or lead-in to the ironing surface. Though some shops draw and iron over a radius, a bevel brings the metal in more steadily and minimizes galling. On very heavy material the results obtained with a large radius aren't too different from those obtained with a bevel. We have in some instances, found an even smaller angle than 15° more effective on steel. Here we took a hint from the way the bevel had worn in other production jobs. There can be difficulty if the bevel or radius isn't right for the job, as the original spherical radius on the bottom of the cup may be pulled off center and up the side wall.

Since the pressures moving the metal are compressive, to be compared with those used in coining, there is a build-up of pressure ahead of the initial contact point that wears the die ring land. This is unlike the wear that takes place, for the most part, at the contact point in a drawing operation. Consequently, we prefer carbide dies if the quantities make this at all possible. In addition, the land below the bevel is kept small in order to minimize the pressure requirement.

If wear occurs, the dies usually cannot be reground as they will become oversize. Therefore, if carbide is not justified, a steel should be selected which can be easily shrunk at the bore to bring it back to working size.

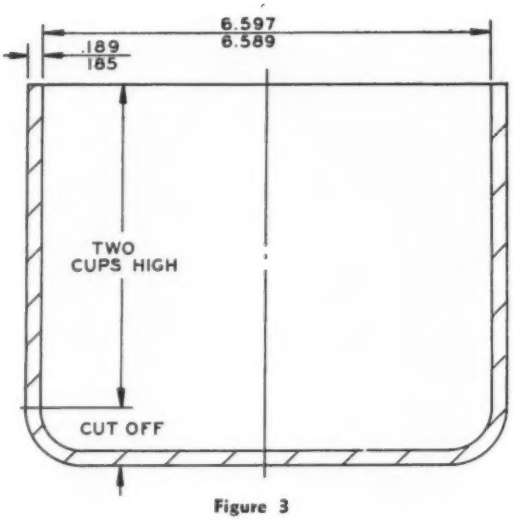


Figure 3

IRONING INSIDE DIAMETERS IS ALSO PRACTICAL and principles similar to those used for the ironing of an outside diameter of a cup may be applied. We have extruded substantial cups. One had a 0.062″ wall at the finish, that started with material 0.500″. It was made of steel having a diameter of 1½″ and was formed in three ironing operations. Its finish was so good that we applied the principle to a flanged sleeve bearing (Fig. 1). By this same process, tubing can be sized as an alternative to ball sizing.

Suppose you have a pulley with a central extrusion for a bearing and you need more bearing length for a shaft. It can be obtained by ironing. Usually 15% of the hole diameter is regarded as a good length increase by extrusion; however, with ironing a 35% increase in length could be realized. The metal is thinned from the inside during this *inside* ironing (thinning from the *outside* takes place in conventional ironing). If the wall is thinned from the ID of a boss, the wall thickness will be less at the end of the extrusion, as there is less metal left to come from the central hole. In some cases this lack of uniformity may be objectionable.

Another useful instance of this type of extrusion is where the need for extra thickness arises. For instance, on a flat part where the thickness will not allow an adequate number of threads, and where welding a nut for the threads would be prohibitive or too expensive, an ironing punch can be used. Here, the punch has a bullet nose which effects a hole as a punch and then irons through, displacing the metal to a new local thickness. Often an increase of 20% in thickness can be realized.

IRONING OTHER CONFIGURATIONS beside those which are round can be done on comparatively shallow shapes, but each job is an individual problem and all may not be successful. For example, what happens in the corners when you iron a small box or rectangular tubular shape? Since metal tends to move to the corners in previous drawing operations, it is necessary to reduce the degree of ironing in those areas by increasing the clearance there. Our recent experience of ironing a large aluminum box of 0.050″ thick metal, was not favorable, and we had to combat the curl and flare from drawing by other means than by ironing. Ironing is not a practical way to form longitudinal indentations or ribs on the outside of cups. Say ribs are desired on the outside of a flashlight case. Unless corresponding relief on the inside wall is acceptable, it can hardly be done. Shallow scratches can be made but the metal will not flow sideways and a corresponding surface must be utilized on the punch and ring for success. If corresponding surfaces are not used, some grains may be pulled out of the structure and up the wall marring the surface.

PAIRED IRONING DIES ARE SOMETIMES USED, one over the other, to reduce the pressure on a single die and therefore reduce die maintenance. We prefer to iron, anneal, and then iron again when double ironing is needed. This was done recently when we ironed 61-SO aluminum from 0.565″ gauge down to 0.218″ gauge — a 61% reduction. These propeller noses, shown in Figure 2, were not ironed through, but were pushed back as one end had to be upset later. Fortunately, it was not necessary for the terminal ridges of the two ironing operations to coincide. When double dies

Since regrinding the "drawing" or "ironing" ring of a die causes an oversize condition and replacement is prohibitive, it is possible to shrink just the bore of this part. In practice, this is done by heating the ring to an appropriate temperature and quenching only the portion to be resized. By masking the ring with an asbestos template, the quenching medium contacts the ring bore only. A makeshift funnel with the proper shaped opening can be made to facilitate this. What actually takes place is the formation of martensite within this localized area which expands when quenched. In this case the expansion inward is toward the bore opening. As a general rule 0.002″ to 0.003″ per/in of bore can be gained for further grinding to size.

are used cold working takes place in the first stage, and the hardness increase in this one operation may preclude further working in the second stage. Until tried, it is difficult to predict that a double die can be used. The safer procedure is to make two dies which allow for an anneal between operations.

IN ONE CASE the required part looked like a job for sized tubing. It was a steel bearing cage, made from low carbon steel. We made it from the drawn cup shown in Figure 3 which proved to be more economical. Actually, the cages were drawn two lengths high and the bottom was cut off. It was necessary that the walls be straight and uniform and since sized tubing has a greater tolerance range than a drawn cup ironed to size, we made it this way. First, we had trouble centering the cup over the redraw die, consequently the wall ran heavier on one side than the other. To correct this we placed a loose ironing ring below the die which did the last draw. Thus the part centered itself tending to equalize the pressures all around the cup's periphery. Until we discovered that the upper draw die was giving a little (enough to affect our clearances) we had a great deal of trouble. Also, by putting an extra deep land (¼") below the ironing bevel, we held the metal tight against the punch, improving the out-of-round condition.

IN CONCLUSION and to summarize briefly, ironing is used primarily for thin walled, heavy bottom parts, or where close control of the outside diameter, the inside diameter, and the wall thickness is expected. A fine surface finish can be had while obtaining straight walls in cups, deep extruded holes, or bosses. If a designer knows the possibilities and limitations of ironing, he can frequently design parts to take advantage of stamping economies, and save the added cost of fabricating parts which are often made by seemingly competitive methods.

end

Ironing metal is cold working, thereby imparting hardness and strength advantages without heat treat. For a more complete run-down on this metallurgical aspect we refer you to October's issue of T&P. In this issue see the article on the "Metallurgy" of cold forming, or the one on "Deep Drawing."

LOS ANGELES GOES AFTER SHORT SUPPLY OF SCREW MACHINE OPERATORS

The biggest group training project ever started in the screw machine products industry is now under way in the Los Angeles area. It is an industry-taught grass-roots program aimed at upgrading unskilled and semi-skilled workers.

Screw machine shops in the area were finding the only way to obtain skilled machine operators was to bid competitively for them. This, of course, cuts profits considerably. To stop such tactics, six local screw machine industry leaders met with the Los Angeles City Board of Education and the California State Department of Education to find a way to train the workers they need. Edgar Broad, general manager of Standard Screw Products Co., headed the group, which also included William Allen, Precision Screw Products Co., Inc.; Harry H. Andrews, Jr., Zila Manufacturing Corp.; Bruce Maday, Advance Screw Products Co.; V. M. Solt, Solt Automatic; and Lewis C. Finkle, Wedgelock Corp.

One of the big problems in technical training, the committee found, is the teachers. If they were taken from the industry involved, they would not understand teaching methods; if they came from outside the industry, they would not know enough about the subject to teach the information thoroughly.

The local school system did not have facilities nor personnel for teaching or training automatic screw machine operators, so the answer was a school for teachers recruited among experienced screw machine foremen and operators.

Requests for volunteers were sent to key personnel at local screw machine shops. The specifications were firm: They wanted applicants with at least five years' appropriate trade experience, not over 55 years old, physically and mentally fit to engage in the teaching service, and with the ability to organize and carry on a program of practical and technical instructions on automatic screw machines, including the ability to give teaching demonstrations of practical skill and technical knowledge.

Teacher applicants selected for training began a three-hour-a-week 20 week course in teaching methods last February at the Division of Vocational Education at the University of California at Los Angeles. The teacher training course was held in cooperation with the State Department of Education and at the completion of it the participants received Class D vocational credentials from the State Bureau of Industrial Education.

With the problem of qualified teachers solved, the actual training school was launched this Fall with approximately 100 students beginning a four-semester course.

Courses are held in three hour sessions, two nights a week at the Trade Technical Junior College in Los Angeles. Machines and equipment used in the program were donated or loaned by local screw machine product firms or industry suppliers.

Cutting feeds and speeds, the theory of cutting metal, coolants and lubricants, cutting tool angles, and the proper use of micrometers and other measuring tools and gages, are subjects for the first semester. Blueprint reading and mechanical drawing are scheduled for second semester, while shop math — the only course being taught by non-industry teachers — estimating time cycles, and the design and application of various types of thread will be covered during the third semester. In the last semester, tool layout, cam design, and job layout will be studied.

ARMORED PLASTIC PRESS TOOLS
Have Life Equal to Steel Ones

A new British development — the metallizing of plastic tooling — has resulted in combined benefits of steel and plastic dies. The development should have much application and value to American production as well.

Photos by F. C. Livingstone, London.

PLASTIC TOOLS have proved their worth in most industries in recent years, but the great drawback to their wider use has been that their normal working life is only about a fifth of that of steel tools which they replace. Now, even that handicap is overcome by a new invention made by the British subsidiary of the Borden Company's Chemical Division — Leicester, Lovell & Company.

Leicester, Lovell have pioneered in England the development of plastic tools of all types and have recently done much extensive research and experimenting to put an armor-plating on a plastic base, instead of having an all-plastic tool. The experiments were started about a year and a half ago and since then a number of steel-covered tools have been used in production runs.

The new armor-plated plastic tools have shown themselves to be ideal for the big volume production called for in the automobile industry, and in the household equipment industry, where runs up to 100,000 of a single part are often the order.

Working in conjunction with Metallization, Ltd., Leicester, Lovell & Co. developed a new technique which extends the application of their Epophen epoxy resin tooling into the region of high production tools, combining maximum wear resistance with economic production methods.

The first step in the production of such a tool is to make a suitable female mold of the required shape for the punch. The surfaces of the mold are then prepared, and a layer of high-carbon steel or nickel-chrome-molybdenum alloy is applied all over the internal surfaces by spraying to a depth of 0.020″ to 0.030″.

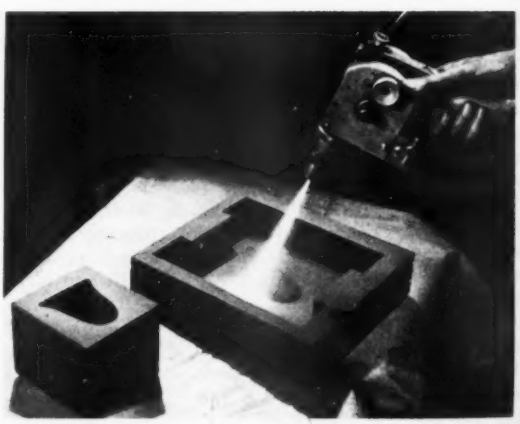


Fig. 1. In making an armored plastic tool, the plaster mold is first sprayed with a coating of alloy steel, 0.020″ to 0.030″ thick. This coating adheres to the surface of the plastic casting.

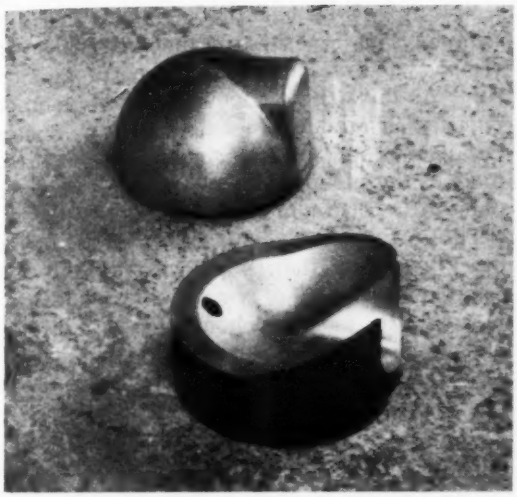


Fig. 2. This metallized plastic punch and die is used for making air filter covers for Vauxhall (G.M.) autos.

A specialized procedure is called for with the metal spraying since the coating naturally tends to contract away from the female mold surfaces. The method of spraying is by feeding a thin wire of the selected metal or alloy into a hand spray gun, in which it is heated to the order of 2,000°C by means of an oxygen flame.

In spite of its short distance of travel from the gun "muzzle" to the face of the mold, by the time the molten metal reaches the surface of the mold its temperature has dropped to about 80°C and therefore does not damage the surface of the mold. The process of spraying the facing of metal into the mold is shown in Figure 1.

A sand-filled resin core is then prepared and hardened in the same way as for conventional plastic tools. This core may be made in the metallized mold with suitable precautions, but it is often more conveniently produced in a separate similar mold. The facing resin mixture is then prepared as usual and applied by brush to the roughened surfaces of the core, which is next placed in the metallized mold.

After the facing mixture has been poured into the mold and allowed to harden thoroughly at room temperature, the completed tool is removed with the sprayed metal adhering to it. After cleaning, the armored tool is ready for immediate use.

If the mold has been carefully made, with low-expansion plaster, or preferably with a suitable epoxy-resin composition, the final dimensions of the tool should exactly duplicate those of the original master.

Where a female die — and possibly pressure rings also — are required, the best and quickest procedure is to make separate molds for each tool component.

Alternatively, a punch may be made and the die cast directly from it by covering the metallized surface with a layer of sheet lead of the same gauge as the metal to be formed in the tool. The lead must, of course, be fitted as closely as possible to the shape of the punch.

The alloy steel is next sprayed on the lead-covered punch to the required thickness and the punch is then boxed in to form a mold. A core, which is preferably made separately, is hung in the mold and the necessary quantity of facing mixture is poured in to cover it. After the resin has hardened, the lead sheet is peeled off the sprayed metal coating, leaving the completed die.

In actual productive use the metallized plastic tool has been found to be superior to an equivalent steel tool of the highest grade. This is believed to be due to the fact that the sprayed armoring is slightly porous and thus holds the working lubricant better and so creates less friction to cause wear.

The British automobile industry has been quick to see the potential value of these armor-plated plastic tools and among the big makers who have already tested them are the Austin Motor Company, Morris Motors, Rover Cars, Vauxhall Motors (the British subsidiary of General Motors — the tools actually being made for A.C.-Delco, another G.M. subsidiary), and Briggs Bodies.

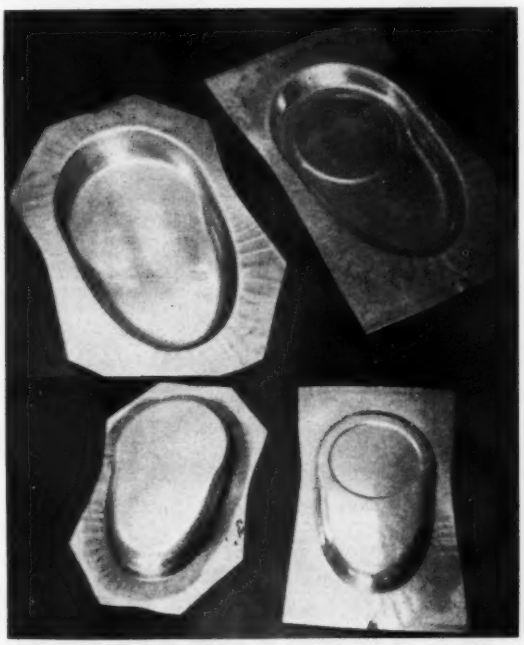


Fig. 3. Head lamp bezels for Rover autos which are stamped from 18-ga aluminum with armor-plated plastic tools. Lower photo shows reverse faces of the bezels.

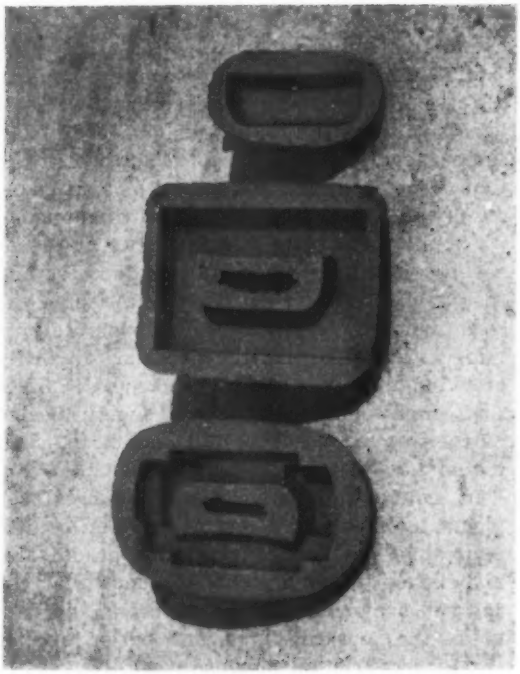


Fig. 4. Sprayed metallized molds ready for pouring epoxy resin plastics for making stampings for eyeglass cases.

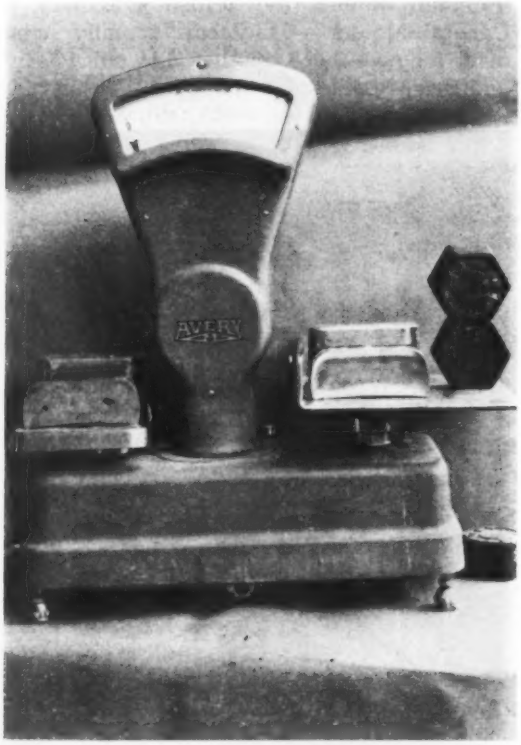


Fig. 5. A comparison in weight of steel tools and armor-plated plastic tools for making eyeglass cases. The steel punch and die (left) weigh 5.6 kg, while the armored plastic tools for the same job weigh only 1.6 kg — a difference of 4.0 kg (8.8 lbs).

It is fully expected that many others will soon be adopting these economical tools for various parts which call for a long production run. As this article is being written, another big British automobile maker — the Rootes Group — is starting experimental use of these tools in the plant of one of its associate companies, British Light Steel Pressings, Ltd.

The economics of armored plastic tools quickly explain their popularity. There is a saving of 75 to 80% of cost in making the ordinary plastic tool, which may have a life of about ⅕th of that of a comparable metal tool.

The cost of spraying the armor-plating works out at about $9.00/sq ft, adding only between 5 and 10%, according to the intricacies of the pattern, to the total cost, but at the same time giving the tool at least a five-fold increase in working life.

There is another very important factor which counts for much in favor of plastic tools, and applies equally well to these armored tools. It was proved during one of the first full-scale tests made in a British automobile plant.

Accidents will happen, especially when the human factor has to be considered. The armored tool was being used on the production of a mild steel brake hose bracket. It had already produced nearly 30,000 pressings without showing any signs of wear when a careless operator fed two blank sheets of steel, instead of one, into the press.

This is the kind of accident which can cause extensive damage to the press itself.

The armored tool had already proved its ability to do the same job as a steel tool in ordinary production running; but, it had also a built-in safety factor in that, when the press was overloaded, it was the armored tool which gave way and no damage at all was done to the press, which was immediately available for the fitting of a replacement armored tool.

It is worth recording that, before the introduction of the armored plastic tool for this particular job, the carbon steel tools which had previously been used showed excessive wear after only 20,000 pressings, whereas the first plastic tool was nearing the 30,000 mark, without wear, when the accident happened.

There is undoubtedly a very big future for tools of this type and the interest of many manufacturers has led Leicester, Lovell & Co. to establish a separate department in their Southampton plant for the production of special tools for companies that do not yet wish to make their own epoxide plastic tools. This new department is also available as a training school for craftsmen who will make the tools in other companies' own plants.

end

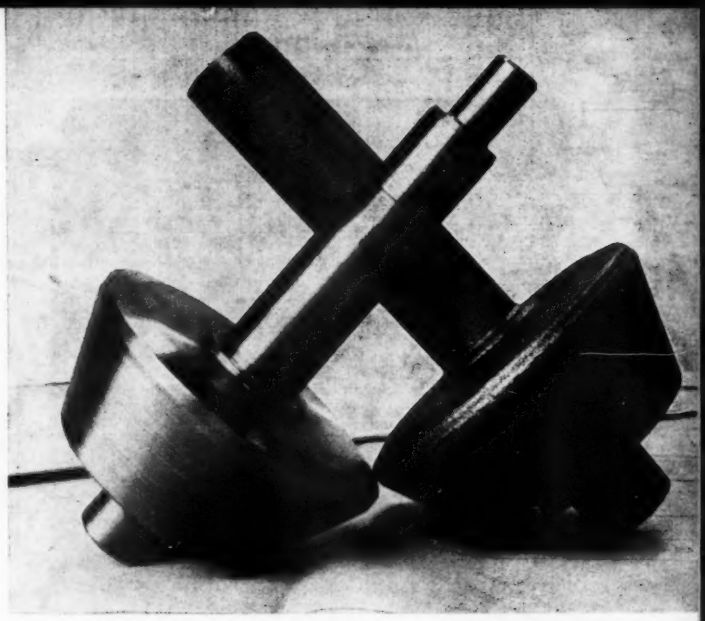


Fig. 1. A stem pinion forging, and a turned and faced blank ready for gear toothing. The forging is approximately 9" long, and is of SAE 8620.

STANDARD MACHINES AUTOMATED FOR PRODUCTION OF FORD STEM PINIONS . . .

. . . Whereby a system of Automatic Loading and Unloading, Inter-Machine Transfer, and Automatic Sequence Control, fully Automates a line of otherwise standard machines.

by E. Willard Pennington
Editor

IT TAKES SIX parallel lines of five machines each to satisfy the demand of Ford Motor Company's Sterling Chassis Parts Plant for milled, centered, and turned stem pinion blanks. These operations, preliminary to cutting the pinion gear teeth, are performed on a combination of standard J & L milling and center-drilling machines and J & L Fay automatic lathes.

The combination making up each of the six lines is shown schematically in Figure 2, and consists of one milling and center-drilling machine followed (from right to left) by four Fays. Between the machines are the inter-machine transfers which, in three instances, give the workpiece a 180°, end for end, turn around, as dictated by the surfaces to be presented to the tools. At the individual machines are the automatic work loading and unloading fixtures.

Thus, from the initial loading chute to the final unloader, the workpiece is being either automatically loaded or unloaded, machined, or transported between machines, and at all times under automatic sequence control.

Figure 1 is a "before and after" shot showing the forging as brought to the beginning of the line, and a milled, center-drilled, finish turned and faced, pinion gear blank as it leaves the fourth Fay, the end of the J & L line.

Next follows a pass under the rolls of a Schmidt marking machine for part identification numbers. Then the conveyor system carries the pinion blank via an elevator and gravity "banking" chutes to a special Cincinnati grinder for a green (or rough) grind before its final ride to the Gleason gear tooth cutting machines. The green grind establishes location for gear cutting.

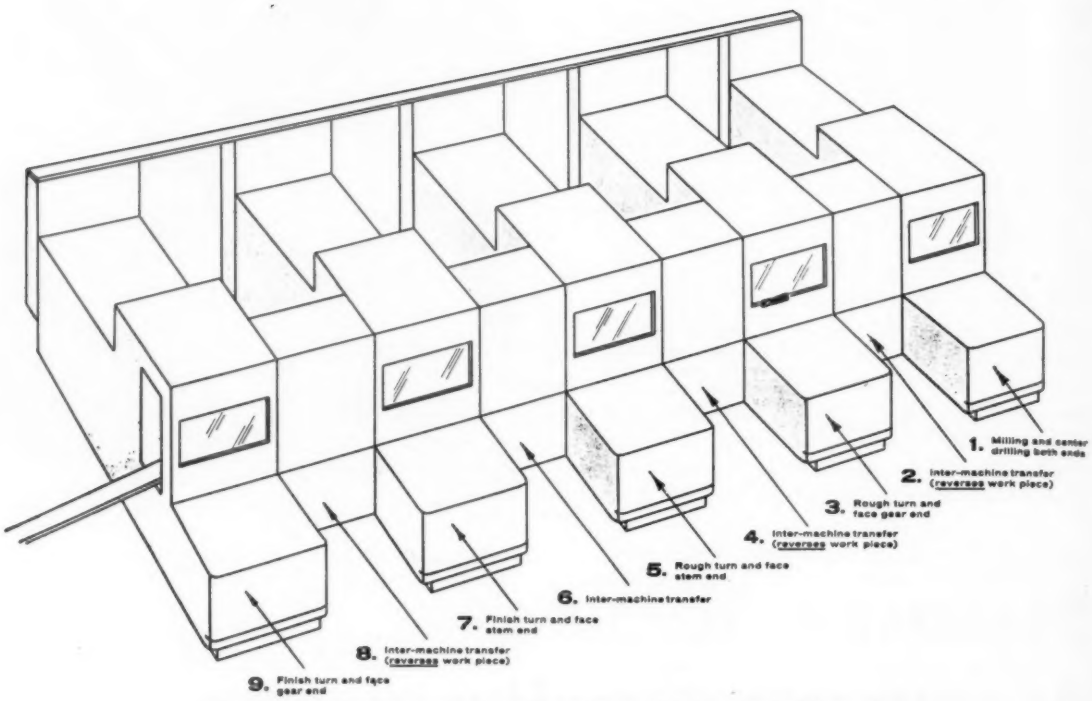

1. Milling and center drilling both ends
2. Inter-machine transfer (reverses work piece)
3. Rough turn and face gear end
4. Inter-machine transfer (reverses work piece)
5. Rough turn and face stem end
6. Inter-machine transfer
7. Finish turn and face stem end
8. Inter-machine transfer (reverses work piece)
9. Finish turn and face gear end

Fig. 2. Ford stem pinions are turned out by six J & L automated lines of five machines each. The machines are arranged with spindles parallel, spindle faces in line, and with 5' separation between beds. As shown, the operations proceed from right to left.

The display shown in Figure 3 shows the operational progress of the stem pinion from forging to engagement with its mating differential ring gear.

The beginning of the J & L line is loaded manually. This operation is depicted in Figure 4 which also shows the first machine where the forging is end-faced, to a total length tolerance of 0.004", and center-drilled. The gravity feed chute incorporates limit switch control of off-size forgings.

A view of four of the five machines in each of the six J & L stem pinion lines is shown in Figure 5. An operator control panel is provided for each machine and one master control station (not shown) synchronizes all the machines in one line. These control panels and their interlocks make automatic sequence op-

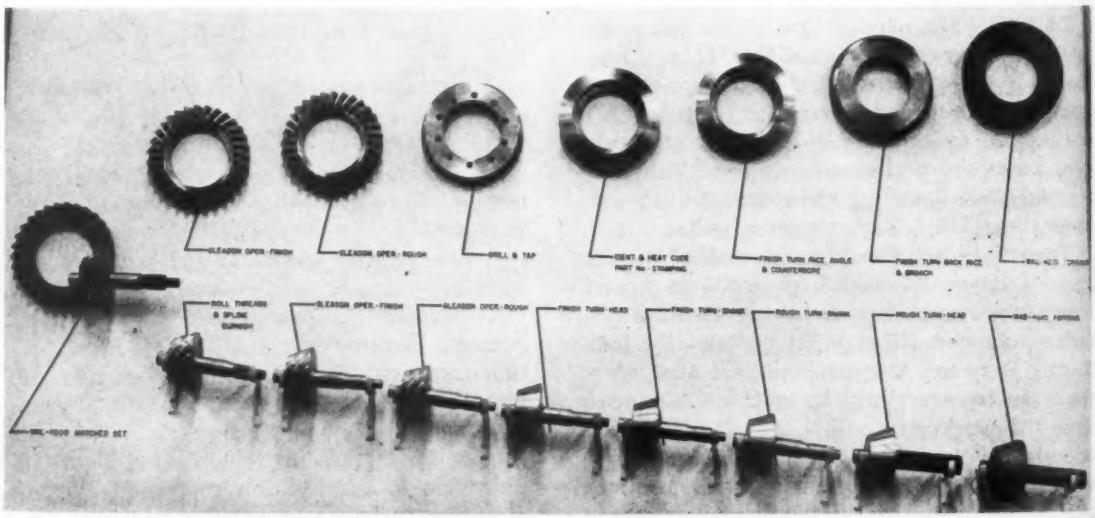


Fig. 3. The progressive processing of stem pinion gears and ring gears as performed at Ford Motor Company's Sterling plant.

eration possible and provide safety features throughout the cycle.

Each individual machine panel has pushbuttons for motor start and emergency stop, and automatic cycle control or manual control is available by selector switch. With the selector switch on "manual", pushbutton control is provided over machine elements, machine transfer steps, and intermachine steps.

At each line's master control station five green lights, one for each machine, indicate that each main drive motor is running. Five red lights, one for each machine indicate that the machines are on manual control. These red lights are extinguished as their respective machines are switched to automatic control.

All five red lights must be off, and all five green lights on, before pushbutton control over the line becomes operative.

If at any time the workpiece is not properly loaded in one of the Fay lathes, a red light appears on the machine panel and that machining cycle will not start. The other machines, however, will complete their operations after which the entire line will shut down.

The automatic machine transfer cycle will not start unless the work is properly positioned in the transfer cradle for pickup. No machine cycle can start unless the machine transfer unit is properly out of the way.

Should the hydraulic pressure fail in the chuck grip line, the feed clutch and spindle clutch are automatically de-energized and the spindle brake is energized. Tool feed and spindle rotation are instantly stopped.

Should an overload develop in any machine in excess of the predetermined setting on the overload control of the machine, the feed clutch will be de-energized to stop the tool feed of that machine. The entire line will shut down after the other machines complete their operations.

Contributing to the line's versatility in both the automatic cycling of the successive operations and the control over and safe-guarding of individual operations (when on either manual or automatic) is the fact that each machine has its own hydraulic power unit. Another reason for separate hydraulic power sources for each machine is the variation, from machine to machine, in gripping (to drive) rough vs machined surfaces, and in tailstock pressures. Further, if a centralized system "went down" the whole line would be down, whereas in the case of independent systems only one machine is affected.

This high-spotting of the character and purpose of the controls incorporated within the line shows that provision has been made not only to initiate every function but also to check on its performance before permitting the cycle to continue.

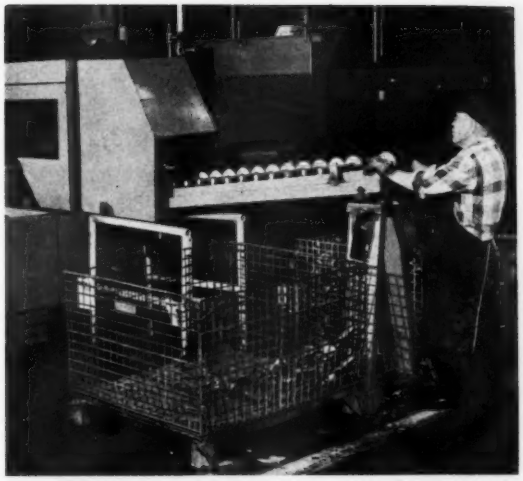


Fig. 4. Pinion gear forgings being loaded into the start of one of the six automatic J & L turning lines. The lines mill and center both ends of the forging, rough and finish turn the gear head and shank ends, and stamp the part with a serial number.

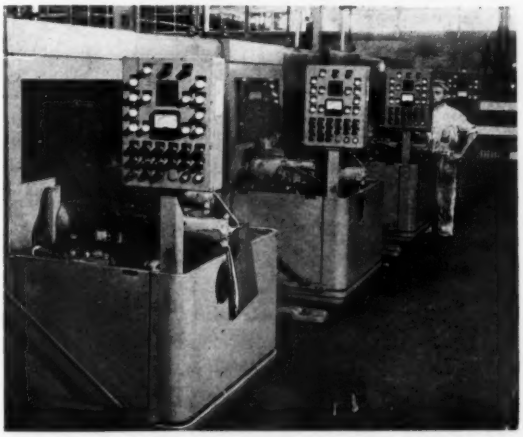


Fig. 5. Four of the five machines per line. The final Fay lathe and the control console or pulpit for the entire line is behind the camera.

The J & L stem pinion line uses carbide tooling from the milling of both ends of the forging in the milling and center-drilling machine and on through the turning and facing operations. Replaceable, solid carbide inserts held in mechanical mounts are used throughout the Fay tooling.

Apportioning the turning and facing operations over the succession of four Fay machines has insured simple and easily maintained tooling. Efficient cutting speeds and feeds for improved work finish and tool life are obtained by the ability to group similar work diameters within common operations.

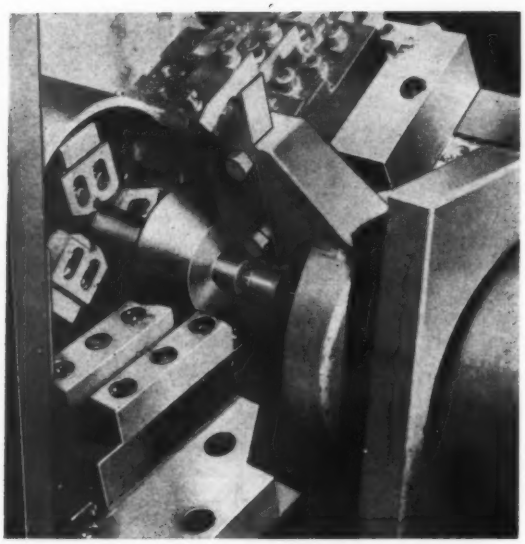


Fig. 6. This close-up of one of the Fay carbide tooled areas shows, additionally, the center-supported workpiece and the special J & L driving jaws which grip and rotate the work at the headstock end.

A close-up of typical tooling is given in Figure 6 which shows the first Fay machine (following the milling and center-drilling machine) as tooled for rough turning the gear end of the pinion blank.

All of the carbide inserts (triangles, squares and rounds) are precision inserts, being held to "tenths" for size, with chip breaker grinds held also to very close tolerances. For dimensional assurance the inserts are held in special or premium grade tool holders. Also, for the ultimate in dimensional control, the tool-setting gages have evolved from the visual or template type to the micrometer-set type.

Brands and grades of carbide vary over the many points of application. Since the lines have been in operation, experimentation has shown as much as 200% increases in pieces per insert position (index). At the first machine station, changing design and grind of the center drills and milling cutters has shown increase of several hundred percent in tool life.

In the first (milling and center-drilling) machine, the workpiece is held stationary between v-type vise jaws for machining to length between opposed face-milling cutters and then is positioned between opposed spindles for the precision center-drilling.

For all the subsequent Fay turning and facing operations the workpiece is supported, located radially, and rotated between centers. The rotational drive is provided by J & L 3-jaw compensating fixtures which equalize and drive from the outside diameters. These driving jaws are plainly seen in engagement with the far (headstock) end of the pinion in Figure 6. Longitudinal location is from the headstock center.

The full automation of the Ford stem pinion line is attained by the application of J & L machine transfers and inter-machine transfers. These elements have "proved out" over a long period of time in other applications and plants. It is their combination, sequence, and control that are new and different in Ford's Sterling Plant setup.

The five machine transfers handle the workpieces in and out of the machines (load and unload) and the four inter-machine transfers transport the workpieces between machines (from their unloaded position at one machine to their loading position for the next machine).

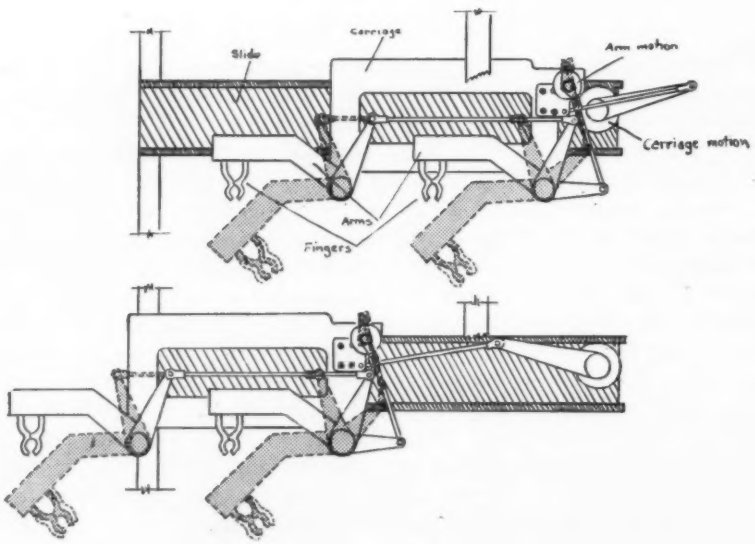


Fig. 7. This schematic shows the two limits of travel of one of the double-arm machine transfers. In the upper view, the carriage is at the extreme right, and the arms are down with the fingers (supposedly) gripping workpieces. The flow of work through the line is from right to left or from east to west.

As the arms go up, the fingers of the east arm lift a workpiece out of the cradle of the preceding inter-machine transfer, and simultaneously the fingers of the west arm lift a workpiece from between turning centers.

When the arms are fully raised, the carriage traverses to the west and the arms go down. The east arm fingers deposit their workpiece between the centers just vacated, and the west arm fingers deposit the piece just turned into the waiting cradle of the following inter-machine transfer. Each piece is loaded into and removed from each chip-making station.

The machine transfers are double arm, hydraulically actuated, parallel motion devices which go to work after all spindles have stopped. Figure 7 shows, schematically, two positions of a machine transfer, and identifies the principal elements, i.e., slide, carriage, arms, fingers, arm motion, and carriage motion.

The inter-machine transfers receive the workpiece as it is unloaded by the machine transfer of one machine and carry it the distance between machines to where it can be picked up by the next machine's transfer. Of course, the first machine's transfer (the milling and center-drilling machine) gets its workpiece from the initial loading track at the head of the line, Figures 4 and 8, and the last Fay machine's transfer delivers the workpiece to the Schmidt marking machine.

Referring again to Figure 2, the machines are arranged with the spindles parallel, the spindle faces in line, and the beds five feet apart. In all of the accompanying schematics and photos the progress of work through the line is from right to left.

The carriage of the inter-machine transfer carries a work cradle mounted on a turntable. The work cradle supports the work by means of two spring-loaded ball surfaces which engage the center drilling on the work. With the exception of the one inter-machine transfer between the second and third Fay lathes, the inter-machine transfers reverse the work end-for-end during the carriage advance from one machine to the next, the turntable swinging its cradle through an arc of 180° in the direction

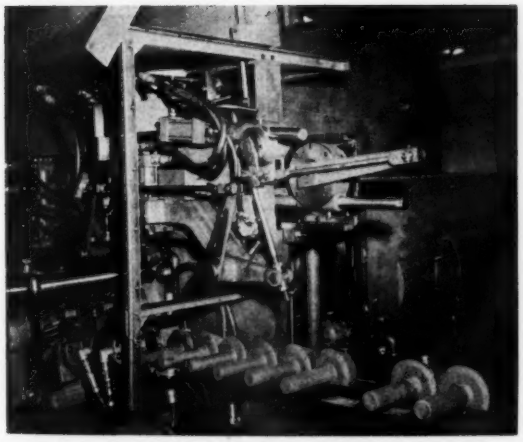


Fig. 8. With shields removed, this view shows the beginning of the line, where the milling and center-drilling machine's transfer takes a forging from the incoming track. The arm and motion linkages of Figure 7 are plainly seen.

of the carriage travel. This motion is shown in the three stages (right, middle, and left) of Figure 9. During carriage return, this motion is reversed.

Coordinated with the machine transfers, the inter-machine transfers first release incoming work to the respective loading arms of the following machines, then return to receive outgoing work from the respective unloading arms of the preceding machines. The work spindles start, and all transfers return to their cycle-starting positions.

The principal components of the inter-machine transfer are its frame, carriage rails, carriage, turntable, and work cradle. These are shown in Figure 9, and in Figure 10 which

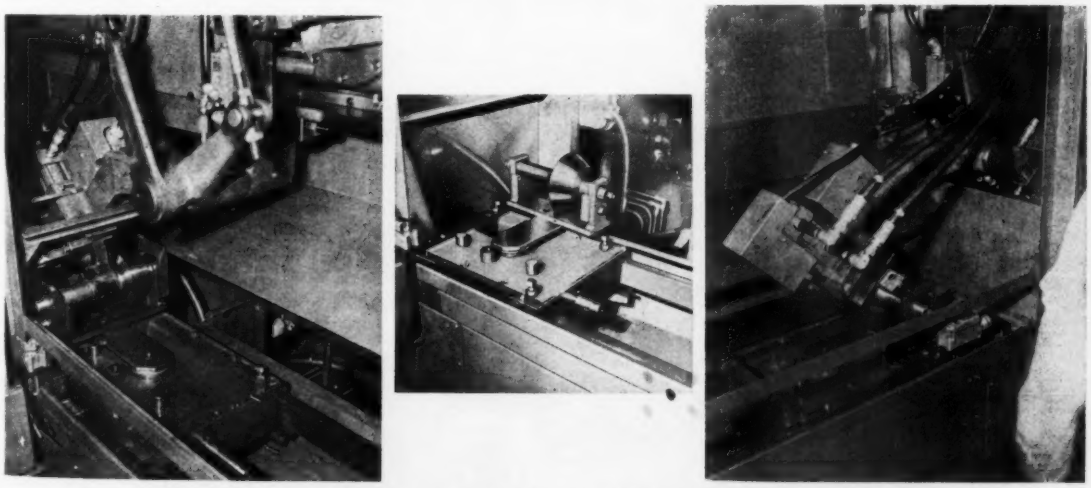


Fig. 9. This three-view sequence shows (1, right) a workpiece just loaded on the cradle of an inter-machine transfer by the fingers of the preceding machine's work transfer; (2, center) the cradle on its way to the left and with its 180° end-for-end reversal of the workpiece half (90°) completed; and (3, left) the cradle at the end of its travel and 180° swing, and the workpiece gripped by the fingers for transfer into the following Fay turning station.

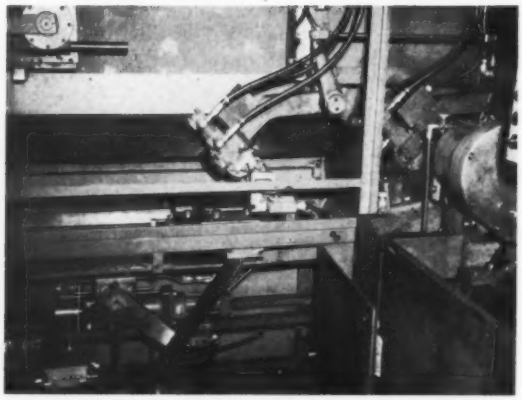


Fig. 10. An opened-cabinet view of the hydraulic actuating mechanism of the four inter-machine transfers. At the top are seen parts of the machine transfers identifiable from the schematic of Figure 7.

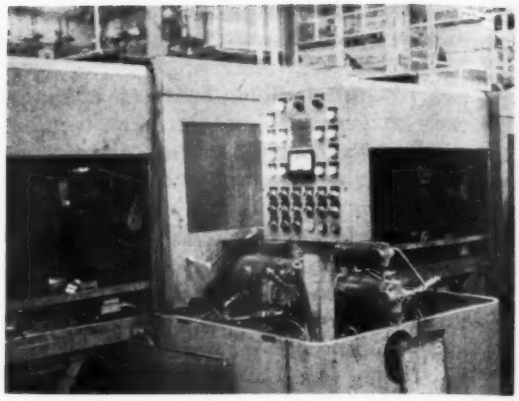


Fig. 11. One of the Fay turning stations with its individual control panel. In the background can be seen fingers and arms of machine transfers and carriages of inter-machine transfers.

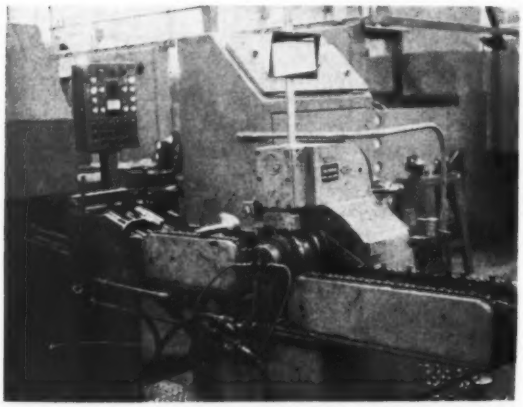


Fig. 12. When seen from the other side of the line, the work flow is from left to right. Here, a fully machined stem pinion blank from the final Fay is about to pass over the marking roll of the Schmidt marking machine. In the background is the slant-topped pulpit from where full control over the entire line can be exercised.

is an opened-cabinet view of an inter-machine transfer. A pair of hardened rails, parallel with the spindle faces is mounted on the top side of the frame. The transfer carriage rides these rails while transporting a workpiece from the unloading arm of one machine to the loading arm of the following machine. The carriage travel is hydraulically powered through a linkage which provides a controlled acceleration and deceleration. Turntable rotation is through engagement of a rack and pinion at each extremity of the carriage travel.

Figure 11 shows, with splash guards rolled aside, one of the Fay lathe stations, its control panel, and the unloading arm of its machine transfer (which is up, having just deposited a pinion blank into the cradle of the inter-machine carrier which is about to take off for the next machine, out of sight to the left). At the extreme right (background) is the unload-

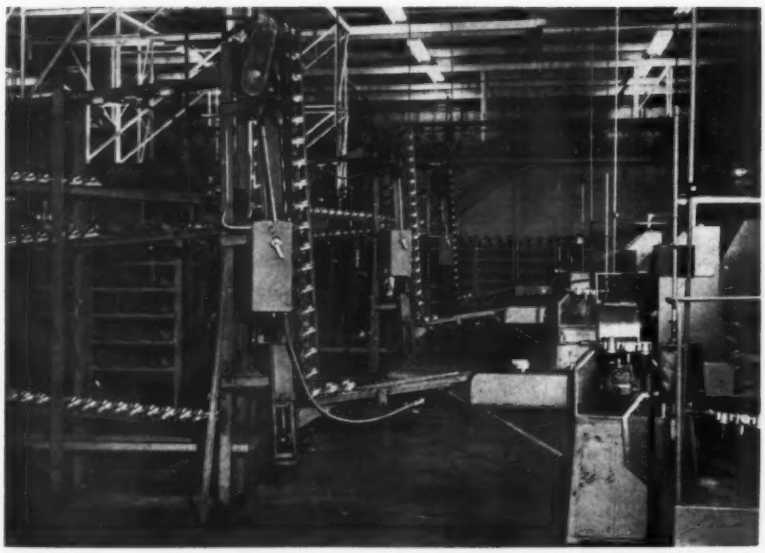


Fig. 13. From the Schmidt marking machine terminating each of the six J & L lines, the pinion blanks go by elevator into gravity banking chutes before moving on to the Cincinnati green grind and the Gleason gear cutters.

ing arm of the preceding machine's transfer.

As noted before, the last operation in the J & L automated line is that of marking the part number (and heat treat batch) on the pinion blank. Figure 12 shows a pinion blank headed for the marking rolls of the Schmidt marking machine. This picture was taken from the other side of the line (compared to all our other illustrations); hence the work is moving from left to right.

From the Schmidt marking press the pinion blanks go to an elevator which delivers them to the gravity "banking" chutes, Figure 13, which precede the Cincinnati green grind. Near the foot of the elevator of each line is an inspection station, Figure 14. Here, between precision centers and with snap and taper gages, a roving inspector exercises Q-C on a sampling basis.

Indicative of the accuracy of the tool settings and the repeatability of the dimensional machining, the final line (6th installed) has run as many as 10 hrs, 54 min @ 134 pieces/hr with only 5 rejects, and those due to forging inaccuracies.

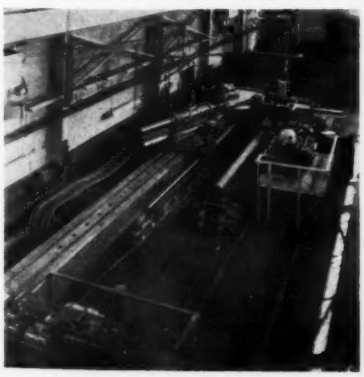
There is a central coolant system for all six J & L lines. Coolant analysis and application is critical in terms of tool life and individual machine operations. Underneath each line is a tank for chips and coolant, which latter is subsequently reclaimed. The machines incorporate easy lubricating methods to minimize maintenance and downtime. The lubricant is introduced to the several machines at their "near points" so the lubrication engineer does not have to roam all over each machine in order to do his stuff.

Fig. 14. An inspection station where a Q-C sampling of the pinion blanks is checked between centers for diameters and taper.

In total, this J & L automation is tooled and performs to hold some 40 dimensions on seven different stem pinion blanks for the "Ford Family of Fine Cars." end

CONVAIR GETS LARGEST RADIAL DRAW FORMER

The largest radial draw former ever built — capable of handling parts up to 40′ long and circular sections to 12′ in dia — has been shipped to Convair, Division of General Dynamics, in San Diego from the Cyril Bath Company. Convair plans to use it for forming curved bulkheads and sheet sections for their new 80-passenger Golden Arrow jet airliner.



The machine itself is 75′ long and 30′ wide. More than half of it will be below floor level, when installed. Because of its size, it has a speaker system for communication between the operator, who rides on a moving platform, and the die setup man, who may be working many feet away from the operator.

The machine's main hydraulic cylinder stretches the metal to shape with 75 tons of force. An additional compression cylinder simultaneously exerts 35 tons of pressure on the work and can be traversed and swivelled readily to apply its forming force to the work at any position. A feature of the machine is a newly developed Bath yield and tension control device which determines the correct tonnage to use in forming each part and insures, by electronic means, that the correct forces are applied in the forming operations.

PLASTIC BLOCKS MARK AISLES ON PLANT FLOORS

A reinforced polyester cap molded to a creosoted wood block has been designed to replace conventional painted aisle lines on plant floors.

Capable of being molded on all types of floor blocks, the colored blocks are permanent, self-cleaning, and reportedly not affected by plant traffic. They can be installed on existing floors, according to Denton Products Co.

Heavy Duty Cut-Off Saws Developed for High Production

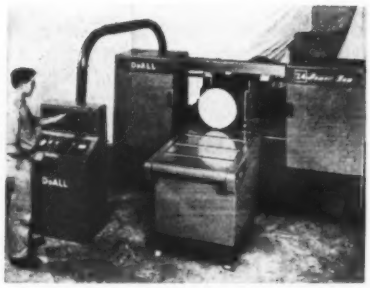


Figure 1

TYPIFYING THE TREND away from the hack saw and toward the automatic band saw for shop cut-off operations are three recently announced production machines. The design and special feature advantages of these saws will eventually place them in competition even though the stock size capacity of the specific models shown are not similar.

They all include the following important features: automatic blade tensioning, centralized controls, variable speed drive, efficient coolant-cleaning streams, automatic hydraulic vise, rigid blade support guides, wide cutting angle, and use of the full cutting capacity of the new high-speed steel saw bands.

The DoALL Model 24 departs from previous designs (Figure 1) with the most conspicuous change in the use of a "U frame" in place of the usual scissors concept. This was accomplished in part by using the upper section of the saw band for cutting rather than the lower.

A torque tube linkage insures correct hydraulic movement of the "U frame" on automatically lubricated ways. Chips are moved by the coolant to screw conveyors in the machine base where they are carried to a drag chain for draining and disposal. Powered rollers move stock into cutting position, and a maximum single index of 24" with up to 6 multiple indexes available so that production of blanks as long as 12' may be cut in automatic production.

Specifications include: a capacity of 24" x 24"; variable speed from 20 to 400 fpm; three motors — main 10 hp, coolant ½ hp, chip removal ¼ hp; the saw band length is 24'3" and width of 2" or 1"; a blade wheel diameter of 32"; and a height of 78".

Henry G. Thompson & Son's contribution is their "Milband" machine

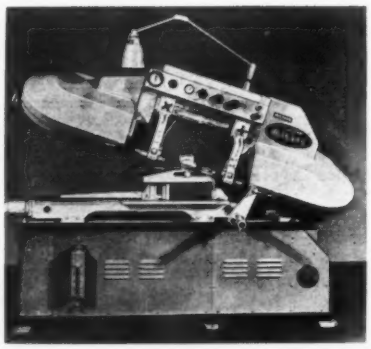


Figure 2

(Figure 2). Produced by the American Machine and Foundry Company and engineered jointly with Thompson, this saw was built specifically to utilize the full cutting capacity of high-speed steel band saw blades.

The hydraulic blade feed automatically compensates for the greater resistance that the blade meets as it reaches cross-section of increasing thickness. Stresses due to blade flexing are minimized by oversized diameter blade wheels and a smaller angle of blade twist between the wheels and the guides.

Coolant and hydraulic tanks are readily removable for cleaning and have convenient filler caps and level indicators.

An optional automatic indexing bar feed makes operation fully automatic with stock length maintained at a high degree of accuracy.

The "Milband" has a capacity of 10" x 10", variable speed from 40 to 360 fpm, a 3 hp motor, the saw-band length is 15' and width of 1", a blade wheel diameter of 22", and a height of 50" (head down).

The Peerless high speed production band saw manufactured by the Peerless Machine Company (Figure 3) has a compensating feed unit which automatically regulates blade pressure at all times maintaining operation at 100% efficiency and eliminating blade breakage. This unit adapts the blade pressure to changes in size, shape, and hardness of material, and blade dulling.

This saw has a counterbalanced frame which protects the work, blade, and operator, and boasts a dual-feed single lever control for operator convenience. Additional specifications include a fabricated steel base, a cast iron table, and anti-friction bearings at all main load bearing points.

and

Figure 3

The Managerial Approach to

AUTOMATIC SEQUENCE MACHINING AND ASSEMBLY

by George H. Kendall, Sr.
Jerry A. Host
George H. Kendall, Jr.
KENHOS CORPORATION
Norwalk, Connecticut

ONE OF THE TOUGHEST PROBLEMS of operational management is to maintain a clear vision of the trends in economic change constantly at work in all industries and among firms of all sizes. The busy executive just does not have time to evaluate these forces to the degree he would like. Many of these factors are brought to his attention only through his reading of advanced new techniques.

In the field of machining, the enormous gains possible through increased cutting tool efficiency have not yet been fully realized. The relationships of various components of the machining cycle are constantly shifting, and proper analysis of them is necessary to make corrections that assure a *balanced* efficiency at all times.

Forty years ago, the prime attack of Industry was on speeding up the rate of metal removal as cutting time then was by far the greatest part of the over-all cutting time. Within the past 10 years, the enormous gains in machine and cutting tool performance have so changed the make-up of the whole time cycle that the cutting time is now the shortest part and loading and unloading account for the longest portions of the time cycle.

On many operations, less than half the total

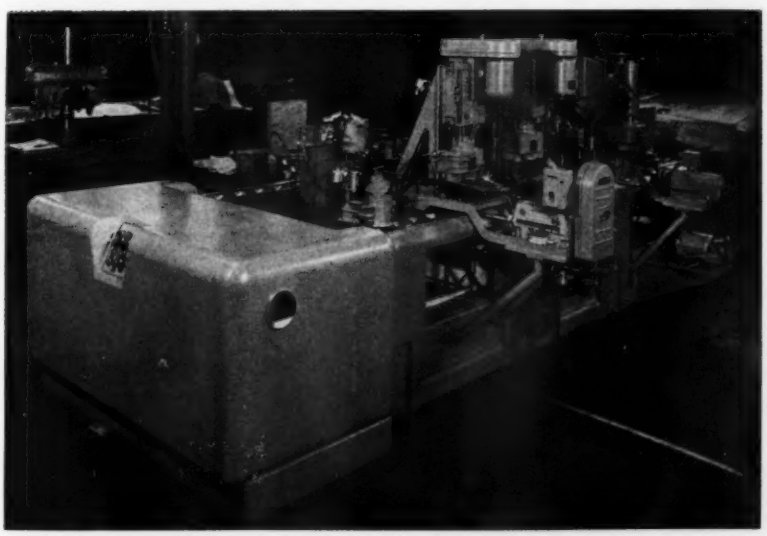


Fig. 1. Typical of the new family of basic machine tools, this Kenhos transfer machine is shown tooled-up for an automatic sequence machining job. More than a machine base, the same identical machine can be changed over (without any wiring changes whatever) from this job to an automatic assembly job in a few hours. Any desired work cycle can be selected from a variable speed single dial operating control.

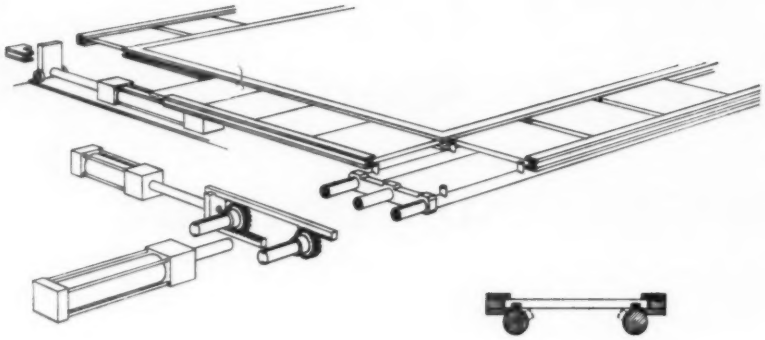


Fig. 2. Pallets or work carriers on the transfer machine are straight-line indexed from station to station by hydraulic cylinder operated twin transfer bars. Rack and pinion arrangement causes bars to rotate sufficiently for transfer fingers to swing below pallets for return of shuttle to original position. Since each pallet is independent, moving through guide rails, a cross-shuttle can be used to transfer pallets around ends of the machine.

time per day is spent in removing metal; the remaining time is spent principally in loading and unloading. So long as these latter functions continue to be done by hand, further improvements in reducing cutting time can have little significance in the increase of production per machine-hour.

If the time required for loading and unloading can be reduced from 10 to 30 seconds down to one second or less, the over-all effect on the actual increase in total time spent per day in removing chips becomes enormous.

In many areas of small parts manufacture, the solution rests with effective utilization of the machine tool type of transfer machine that has been designed to automatically move the workpiece from station to station in split-second time without any individual labor whatever. All intermediate manual handling is eliminated, as the automatic sequence of operations completes the part by the time it is delivered from the transfer machine.

The same trends and factors apply to the assembling of products. Realization of these facts will lead, in the next few years, to the setting up of mechanized assembly departments . . . just as we now have lathe departments and others. Such action shall be essential to return the balance of productivity factors to an assured future progress level. This applies to virtually every one of our manufacturing industries.

Problems That Are Basic

Two basic problems face management in setting up the long range programs that will assure correction of and maintenance of opera-

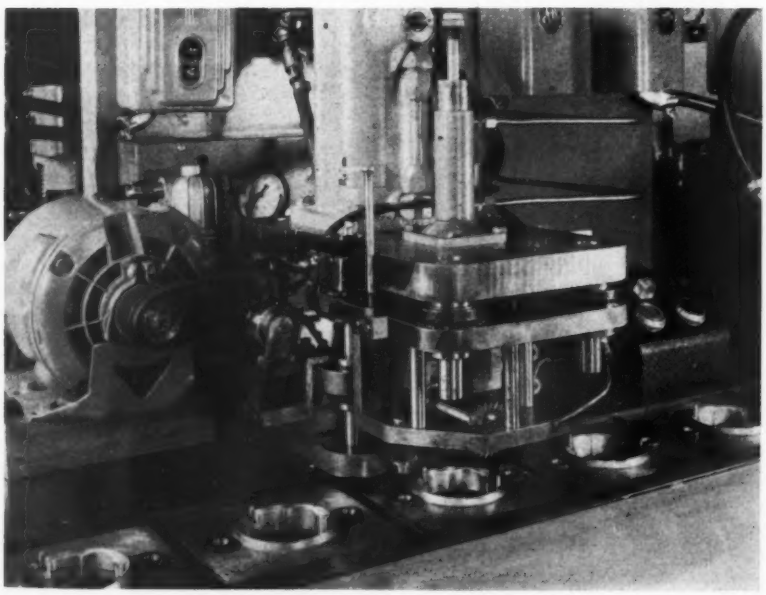


Fig. 3. All station tooling is selected or built for complete interchangeability. This shows how a milling attachment can be applied. Note tapered pins in pallets for precise positioning of workpieces. Also note hardened bushings in pallets for registering tooling relative to workpieces. All pallets are full floating on the "Z" plane of accuracy.

tional balance necessary to remain completely and competitively strong. These problems are:

1. Selection of the proper program and equipment.

2. Review of present product design as to ease of manufacture with a minimum of tooling expense.

In many fields, the design problem is far more serious. There are more poor designs that are excessively expensive to produce by machining, forming, or assembling than is generally recognized. The last war dearly proved the need to recognize this basic fact. In the future, new product design should be strictly a team operation, with product designer and tooling engineer participating from initial concept of a design through its release to manufacture.

These are fundamental deep-seated facts for management to consider in its long range study and evaluation for the degree of strength or weakness they will be willing to assume.

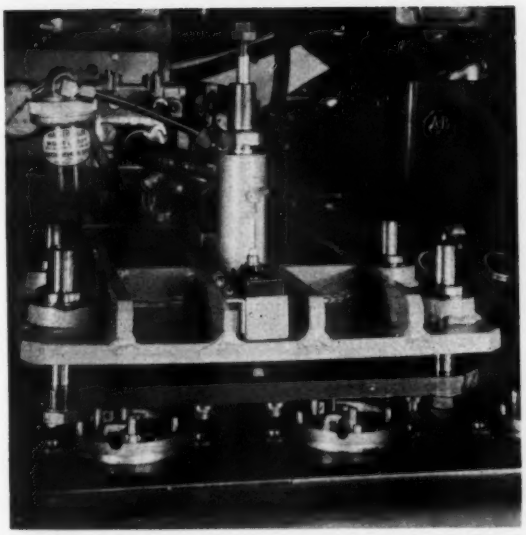


Fig. 4. Successful application of automatic machining and assembly depends in part on the provision of sufficient inspection devices or stations to detect trouble before it is compounded. Here is shown a probe station for detecting broken tools in holes of the workpiece. Note die cast parts positioned in combination work nest-pallet.

Automatic Sequence Machining

The basic equipment for small parts manufacture by automatic sequence machining and assembly, is considerably different than the giant transfer lines now used for manufacture of such automotive products as engine blocks. The new type of machine is evolving into a package unit, strictly a machine tool as we know it today.

By sequence machining, we are referring to the art of extending the principles of progressive die strip and web to all types of machining operations. This is accomplished by means of holding the part within the web or strip of material as it is carried from station to station, or by substituting carriers or pallets that index from station to station.

Many product parts, in various industries, require from 20 to 90 operations (or more) for complete production of their design. At present, the conventional practice is to use a great number of tote boxes to transfer workpieces from machine to machine as each operation is finished. The result is a large number of machines, handlings, and people. With sequence machining, all operations can be done on one new machine with (usually) just one operator. The degree of accuracy and uniformity that results provide a new high standard of quality for the shop.

The automatic sequence machine is a self-contained package with built-in provisions for coolant supply, chip removal, and other service functions. The design fundamentals for such machines are basically the same for sequence machining and for sequence assembling, and machines have been designed that are capable of handling both classes of work. One design is a small four-side Transfer Machine that incorporates many of the features of the more conventional dial index machine.

There also are a considerable number of applications consisting of only a few operations — machining or assembly. To meet this need with a minimum investment, the same tooling attachments are grouped and interlocked with only a simple transfer fixture. Such an arrangement is also normally feasible with very short runs.

Assembly by Automatic Machine

While most factories with progressive managements have various machining departments equipped with the latest machine tools, many of the same factories still do virtually all assembling by single-station, hand operated machines or only hand tools.

The introduction of automatic machine assembly usually can increase production per operator from 10 to 15 times over that possible with hand assembly methods. Where a present volume of 500 to 2,000 assemblies per day is best obtained by manual effort, machine assembly can easily provide production of 16,000 to 20,000 assemblies per day per machine.

Successful automatic machining brings under rigid control all production variables affecting assembly. In many cases variables not

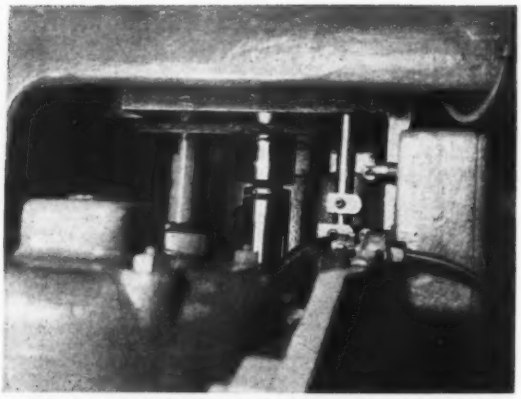


Fig. 5. The main frame of the machine tool base is open at a maximum number of stations to provide access for tooling from beneath the pallet. Quick-change tooling attachments are used to cut machine downtime for tool changes.

previously noticed will be brought into focus because they must be controlled if downtime is to be avoided. The new assembled product will, however, have a far higher degree of uniformity and therefore a more uniform high performance.

Downtime on an automatic assembly machine is more apt to be caused by variations in the parts being assembled than by the machine.

Once in a while we hear someone remark that automation is only for mass production, and their needs are only for a few hundred pieces per day. It is not necessarily so, that automation is not for them, as there are many different types of fixtures and machines that very often can effectively supply continuous automatic operation, at attractive savings, for relatively short runs or for intermittent production.

For example, where there is a series of similar products with only one or two parts varying from product to product, it is practical

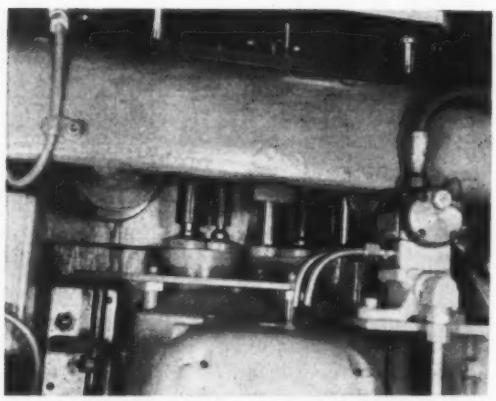


Fig. 6. Underneath tooling with vertical cutting tool spindles. Probe and hold-down functions are performed from head directly above the pallets. Note, at left center, the rollers provided for smooth reciprocating action of the pallet transfer bars.

to machine assemble the whole line; whether volume is only 25 or 50 or 100,000 at a time on any particular model in the series. This is made possible by providing one tooling attachment for each different part and of coding "on"-"off" switches for the operator to select the attachment for the specific product being assembled. Setup time can be completely eliminated by this method, giving production infinite flexibility — enabling very short run variations to be assembled on the same machine used for longer-run items in the same series.

Another type of very effective assembly for those mixed short runs or for production runs that are repeatedly interrupted by "hold" or "rush release" orders, as often occurs in automotive supplier production, is that of the paced or Group Assembly Machine. This is often referred to as "mechanized bench assembly".

The Group Assembly Machine is usually a very large turntable, or a straight-line conveyor type machine base, with no tooling whatever other than work nests to hold the parts being assembled, and with a group of operators seated along the side of the machine. Boxes of parts, with one low near side, are placed close to the edge of the work nests so that the operator has a very short hand movement to take a workpiece from the box and place it in position in the work nest or on the assembly being built. Portable tools suspended from an overhead rail can be used for driving screws or studs or nuts.

The conveyor moving the work nests from station to station can have intermittent index or continuous motion to suit the plant's specific needs to best advantage. To change from one to another product, requires only change of boxes of parts and occasionally the work nests. Usually, plants assembling products by hand using Group Assembly Machines use them in pairs. Operators shift from one machine to the other while the setup man changes the first to suit the next item to be produced.

This Group Assembly Machine, with its paced rate of production, has greatly increased the productivity of hand assembly operators for this class of work. The capital investment is low, and the labor cost per unit produced by such semi-continuous hand assembly is low. These machines, however, have to be most carefully designed, with all the essential elements needed to assure efficient high production rates without operator fatigue.

Economics and Investment

Once in a great while, we hear someone remark that automation is far too expensive for

their particular business. The facts, however, do not support any such belief. In today's markets, if you need automatic assembly your costs are paying for it anyway. When looking at the cost of such equipment, one should consider that the cost covers a group of 6 to 24 operations and that the cost is moderate and usually is less than single machine costs. Presently, several different makes and types of base machines (less tooling) range in cost from $500 to $1500 per station.

An analysis of experience across Industry over a 2-yr period indicates that the investment for automation of any hand operation will seldom vary greatly from one to one-and-a-half times the annual wage paid for that hand operation. This is, from 2.5 to 5.5 thousand dollars per station is the necessary investment to secure *full* automation for each hand operation.

A breakdown of the costs involved in various full Automatic Assembly Machine packages discloses that tooling attachments will average from 65% to 85% of the total cost of the package, with the balance paying for the assembly machine base. In general, the investment cost of tooling attachments for any of the different types of operations or for different types of machines to do a given assembly job will not vary greatly one from another.

The design of the product, however, is something entirely different and has a vital effect upon the total cost of the package. If the design of the product has been in the hands of one thoroughly familiar with tooling and shop practice, or has benefited from collaboration of such a person, the chances are that simple and single rather than complicated compound tools can be used for machine assembly. Much more needs to be done in product design before the lowest costs for machine assembly can be fully realized.

Tryout and adjustment of an automatic assembly machine and its tooling attachments may be expected to require from 1 to 3 months, at an expense of 5% to 15% of the cost of the project equipment. This "debugging" requires careful and continuous attention and direction by management. Changes of personnel during this period are certain to wreck the program, as no two engineers or setup men will agree on anything and the program is apt to drag into endless changes. Provided the personnel involved are carefully selected and competent, management needs to protect them during this period from interference of any kind; the adjustments and minor modifications necessary to achieve operational perfection of the mechanism take considerable time and concentrated attention as well as infinite patience.

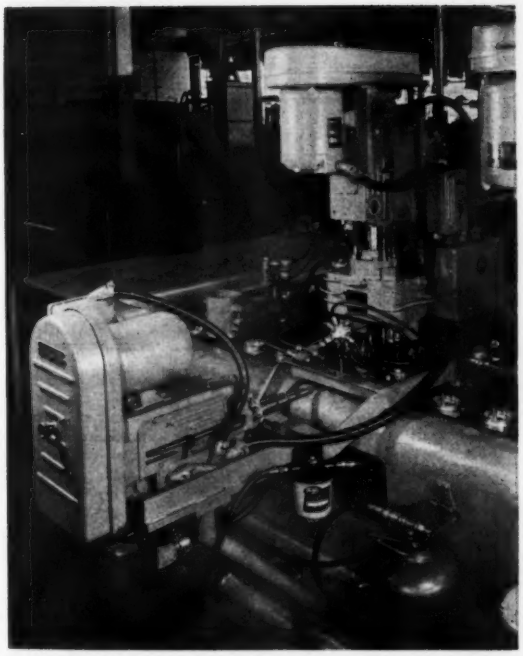


Fig. 7. Operations can often be done in combination, to conserve space and improve accuracy of relationships. Here, a single vertical Drillmation powerhead drives two gear boxes to two separate pallets, while an outboard drill unit operates from the side.

Once it is operating properly, this class of automation machine requires very little maintenance and usually has a pre-established stopping time so that all service work can be done at one time. When used for sequence machining, grind life of cutting tools is predetermined and stopping times programmed so as to avoid unnecessary downtime.

Planning and Design Problems

In many instances this past year, our staff has found it necessary to recommend the prod-

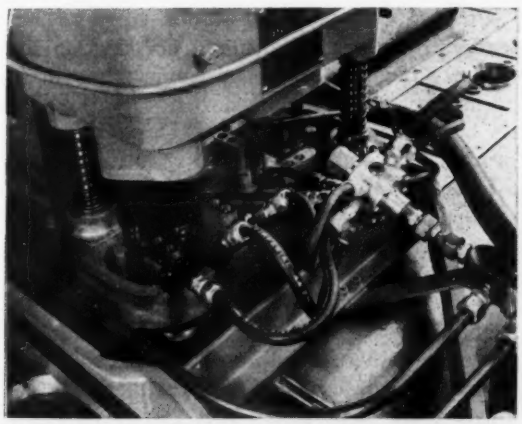


Fig. 8. Close-up of the same station showing spring-loaded stripper plate and manner of mounting coolant and hydraulic lines. In this view, pallets are shown empty.

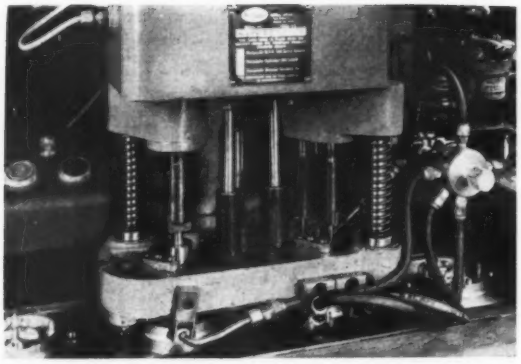


Fig. 9. Another example of double-pallet tooling from a single power drive head. Note the "conversion box" at the left which contains sufficient circuits to permit wiring in any available attachment or portable tool, without extensive rewiring of the machine itself.

uct be redesigned before issuance of authorization for tooling for machine assembly. It is essential to realize that many products were designed long before machine assembly was thought of, that the design of many products has been static throughout the years, and that many of today's product designers have never had the benefit of apprentice training or shop experience . . . and the automatic assembly of the product suffers accordingly.

Machine assembly requires that components of a product go together easily in virtually telescopic fashion.

Management in this day of specialization is faced with a major problem of finding a substitute for the man with the old-fashioned shop apprentice training. Our present product designer needs to closely coordinate his thinking with that of a skilled tool engineer having today's nearest thing to an apprentice-trained skill, to assure low-cost manufacture of the product.

One of our most ingenious management leaders of a great multiplant corporation has actually put this advanced cooperative method into practice in the past year. To illustrate its benefit, estimated tooling costs of a new proposed product as initially styled were totalling something over $1,000,000 before the tool engineers were requested to join conference discussions. As a result of these informal discussions between the product designer and the tool engineer, compromises enabled the proposed new product to have a total tooling cost of something less than $400,000. The actual cost of manufacture of the product was reduced more than 41%. This is a remarkable saving and illustrates the value of the tool engineer if his skills are brought into play *before* designs are frozen on any new product.

Some such sound, common sense approach is essential to our scheme of things today to take the place of former shop apprentice trained designers with their practical know-how.

No greater challenge has ever been offered the tool engineer than that offered today to make practical these new advances and savings possible by the use of automation methods. The development of a new product today should really be the result of a *team* of skilled product designers and tool engineers working together *before* designs are frozen.

We hope our engineering societies, as well as technical schools, will see this opportunity and rise to the needs of Industry in this respect.

Future Outlook

The future outlook in automation will show a continued, gradual establishment of both automatic sequence machining and assembly through the use of automatic machine tools and the establishment of departments for their use.

The rapidly growing population and higher general wage levels which are giving better living to millions of Americans also require a higher rate of production per operator to sustain them. These conditions will force management to utilize more and more automation to maintain a sound and practical balance of our economy than has ever been known before.

The economic forecasts of our industrial leaders indicates it is essential to double production in the next 15 years. The increase in our growth of working force will amount to only about 11% in the same period. The contribution that increased automation can make is obvious.

Automation progress is being bottlenecked chiefly by two factors today. First, probably is a lack of understanding of what practical automation is and of a lack of men trained in continuous-automatic-equipment design and manufacture. The second and more serious factor is the more basic lack of creative design power in this country. From this group must come the men to create automatic feeding and actuating devices suitable for the enormous variety of parts and products to be machined and assembled by these new methods.

It is our feeling that the universities and technical schools of this country will be required to offer special courses in advance design to assist in the solution of this problem. In fact, several in the past year have started to do so. If this trend continues, it should help materially to alleviate the scarcity of properly trained design engineers.

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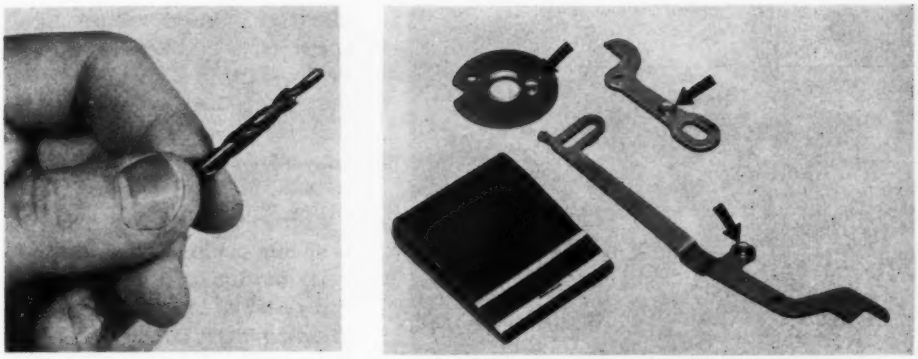


This tool, ground by Burroughs . . . spot faces these small holes in one operation.

A CASE STUDY: A Difficult Special Tool Grinding Job Solved

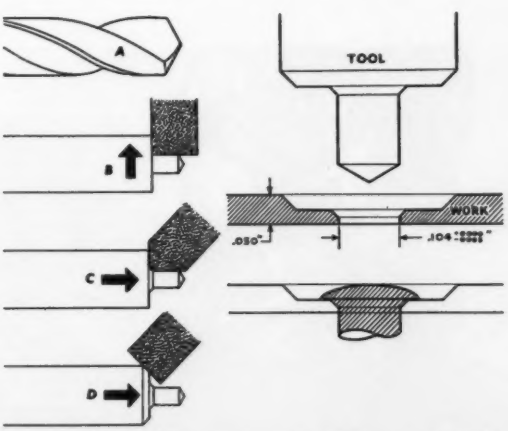
A discussion with John Miller, general foreman of the tool making department; Hugh Gascon, engineer; and Russel Creel, community relations supervisor, at Burroughs Adding Machine Company's Plymouth, Mich., plant reveals how standard twist drills are reground with integral pilots, to do spot facing and chamfering, without undercutting at the point of intersection.

MULTIPLE OPERATIONS on holes in product parts must often be performed singly as two operations, or with the subland type tool in one operation. The trouble with these methods is that with one cut following another, burrs usually form at the intersecting or overlapping point. These are avoided by Burroughs Adding Machine Company's Plymouth plant, where ordinary twist drills are formed and sharpened to perform multiple functions such as spot facing and chamfering, and the method they've developed eliminates the burr when the tool is put into use.

Using a Royal-Oak universal form relieving fixture and grinder, Burroughs operators are able to grind and maintain the pilot diameter size while form relieving the end cutting portions of the tool. Their method eliminates undercutting at the point of intersection of adjacent tool diameter.

The Burroughs Plymouth plant produces many small stamped parts for business machines from cold rolled strip stock. The pieces illustrated are typical; they are only 0.050" thick. Use of some of these parts require that they be riveted and that the rivet head not protrude above the elevation of the part. To accommodate the rivet head, the area where the head must recess is spot faced. This is high production work, so it is not practical to bushing guide the cutter performing the operation. Instead, the cutter pilots in the work, which at the bottom of the cut is quite thin, leaving minimum bearing surface for guiding the tool.

From experience, Burroughs found that standard twist drills, reground with integral pilots, are most practical for this work since many of these jobs include drilling as well as spot facing, and on others, the drill serves to



Standard twist drills are ground as shown at the left on an R-O Universal form relieving fixture and grinder. Drawing at the right shows the tool and how the workpiece is cut for recessing a rivet head.

The tool is held in a bushing supported by an R-O steady rest for grinding.

deburr the stamped hole to size as it enters. The use of these drills, however, is possible and practical only because they can be reground without producing an undercut at the intersection of the end cutting blade and pilot. With an undercut, the tool would not pilot in the thin stock; but, with the pilot ground undersize, would be free to operate off center. Accordingly, the tools are ground in an R-O type fixture to preserve the pilot diameter with subsequent resharpenings of the intersecting blade.

Before they had an R-O fixture and grinder, Burroughs sent such tool grinding work outside — at an added expense of from two to four days' time. Now, with an R-O fixture and grinder in their tool grinding department, they have the tools ready when they need them to keep production going.

The problem of forming flat faces on the blades and a relatively sharp corner at the intersection of the blades and pilot is easily overcome, the company reports, by the use of small diameter wheels. Burroughs uses the high speed (45,000 rpm) R-O internal grinding attachment with a small wheel. This attachment mounts on the back of the grinder column, and its installation in no way interferes with conventional use of the regular spindle and larger wheels for other work.

In the application just described, the column is swung around 90° and the fixture is set for axial motion only into the wheel, producing end relief of the spot facing blades and finish grinding the pilot to size without relieving it. Burroughs also uses the standard guide bars and center bracket of the fixture with a standard drill bushing inserted to obtain complete rigidity of the small diameter tool (under $1\frac{1}{32}$") during grinding. Larger tools are supported in the steady rest, which accommodates bushings for drills $\frac{7}{32}$" to $1\frac{7}{8}$". This method virtually eliminates the problem of chucking trueness and assures concentricity of pilot diameter to the body of the drill since the pilot diameter is generated from the body of the drill supported in its bushing. An added advantage reflected in this method is that the drills may be repositioned easily after removal for checking or repositioning for subsequent grinding operations.

It cost Burroughs about three times as much to have this work done outside its plant. New, with the R-O equipment, the wheel and time cost for producing this one tool — which is but one of many ground now on the R-O — is $1.43. Adding drill cost to that makes the total cost $1.85. Regrinds cost less than $1.43 because it is not necessary to rough out the pilot on regrinds. Although it is not possible to obtain exact prices on work Burroughs formerly purchased outside, Mr. Gascon indicates that it ran as high as $6.00, including the drill.

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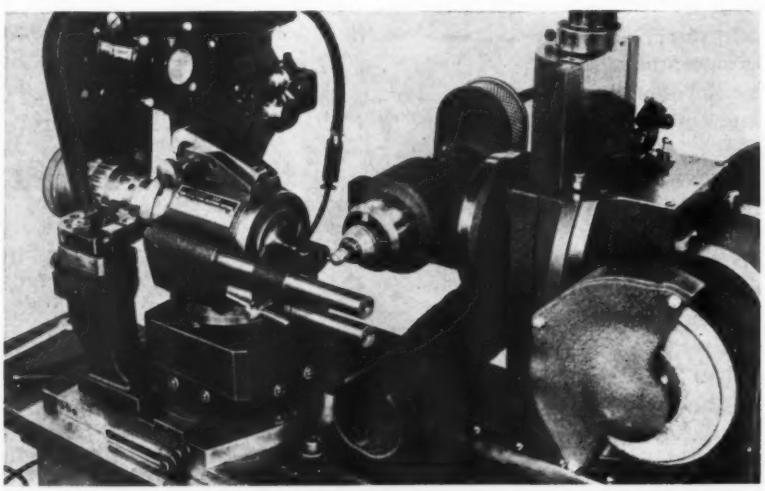
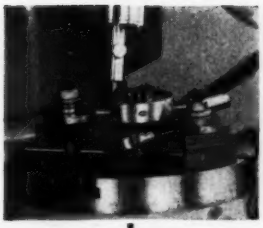


Internal attachment swung 90° for relief of end cutting spotfacing blades. Pilot is finish ground on this operation, and there is no undercut where blade points intersect.



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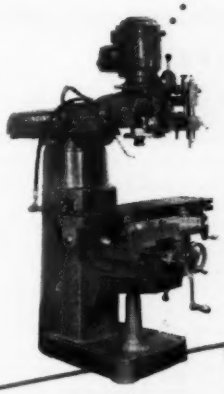

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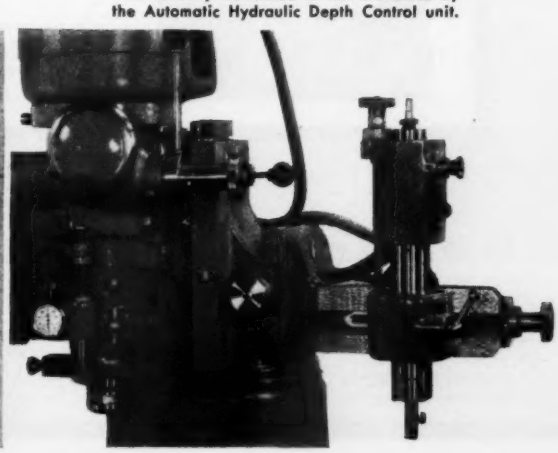
Intricate detail in chessmar hob milled on a CINCINNATI Contourmaster Milling Machine

Vertical profile of the master is accurately and automatically translated to the die block by the Automatic Hydraulic Depth Control unit.



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"HAND-LAPPING EXPERT"

Some of my best friends are curs. This one is Montmorency, who used to be regular as they come, until success turned his head. Drawn by a mutual weakness for Goethe, Kim Novak and chocolate nougat, Monty and I were real pals. We went everywhere together... matinees, shoplifting expeditions, bohemian coffee klatches, and so on. Then came success... for Monty. He wangled his way onto a TV panel show, and made a sucker out of the MC, using witty repartee he'd learned from me. A grateful public lionized him overnight. Now he's independently wealthy, wears gates-ajar collars, writes shaggy man stories, and cuts me dead whenever we meet. Ah well, we learn from experience!

One thing I've learned from experience is that the J & L Optical Comparator is a mighty important factor in the quality control operations of plants, large and small, throughout the country. The reasons are pretty clear: the J & L Comparator is speedy and precise (to .0001") and its extreme versatility makes it adaptable to many different types of inspection work. The J & L Comparator saves time, money and scrap, not only on long production runs, but in small job-shop work, too. With a J & L Comparator, the most complex inspection jobs can be done speedily, accurately and efficiently. Available in a range of eleven models, both bench and floor types. For detailed information, send this coupon *today!*

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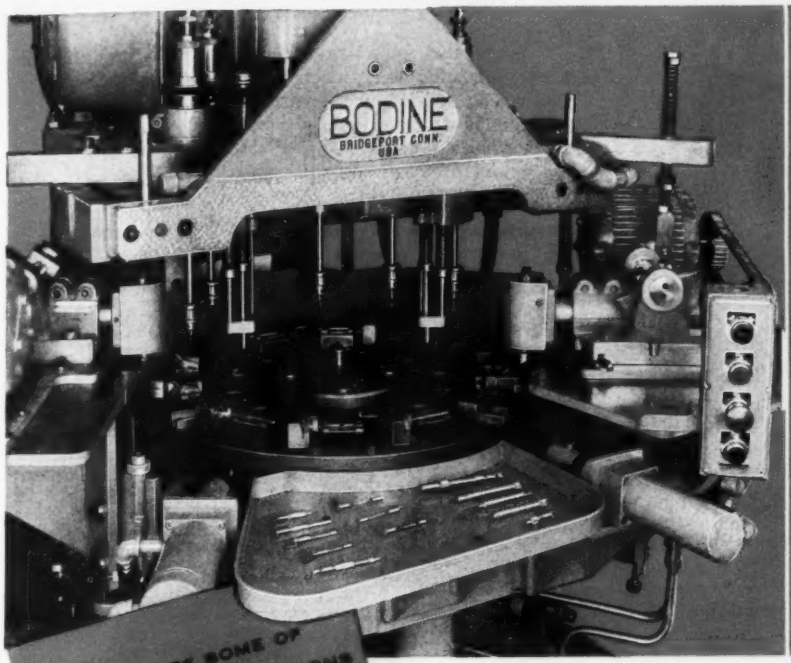
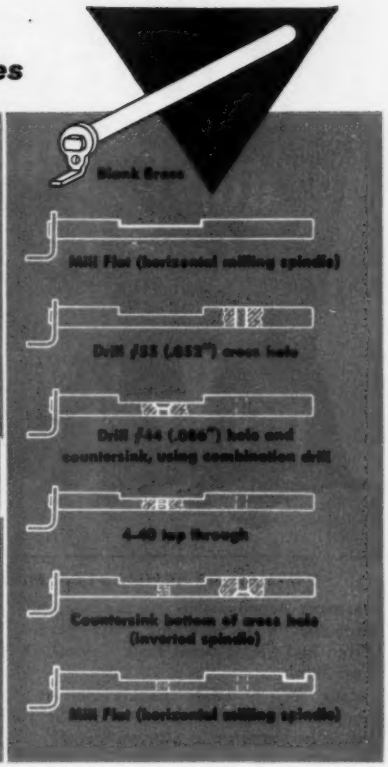
CIRCLE INFORM-A-GRAM KEY NO. 102

Bodine case history no. 47

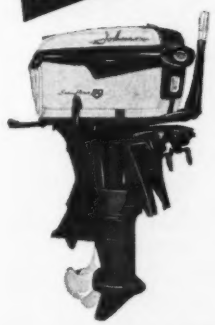
Johnson Sea-Horse throttle shaft in 14 varieties




Blank Brass
Mill Flat (horizontal milling spindle)
Drill #55 (.052") cross hole
Drill #44 (.086") hole and countersink, using combination drill
4-40 tap through
Countersink bottom of cross hole (inverted spindle)
Mill Flat (horizontal milling spindle)

THESE ARE SOME OF THE MANY PART VARIATIONS HANDLED ON BASIC SET-UP

unique BODINE combination tooling like this is part of the "Sea-Horse" saga



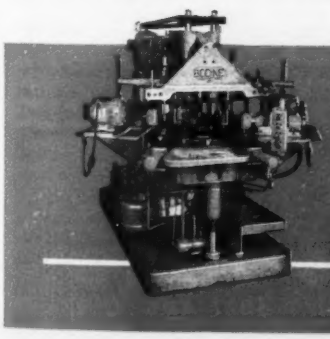
For years Bodine machines and methods have been helping Johnson produce intricate outboard motor parts to high precision standards . . . and within equally close cost limits.

This unusual combination tooling for drilling, tapping and horizontal milling operations is the latest example. No less than 14 variations of these brass throttle, choke and shift parts can be produced on this one machine with fast and simple change-over.

Note the tough holding problem, with holes and flats to be accurately located relative to a crank arm. Note, too, how Bodine swiveling milling heads permit required changes in both width and location of slots. Ready accessibility of tools, indexing table, etc., is obvious. The figures below complete this interesting story . . . and the chances are that Bodine can work out an equally practical and efficient approach to YOUR problem. For further information, write Dept. TP-11.

production data: 550 pieces per 50 min./hr., operating at 11 strokes per minute with manual load and unload.

SBD87



This tooling uses the basic Bodine 42-30 Machine with standardized spindles and horizontal milling attachments. Note how compact this production unit is, requiring only 7' x 8' of floor space.

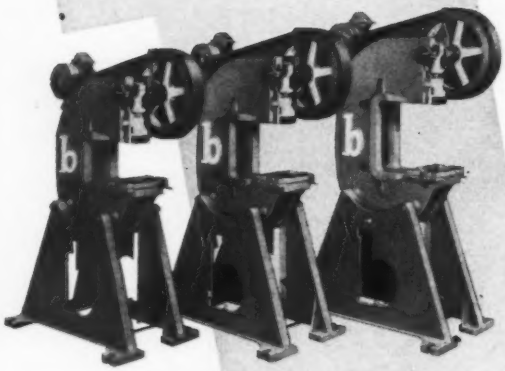
THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 103

6 NEW "PRODUCTION-BUILDERS" from benchmaster

Benchmaster, the world's largest manufacturer of small punch presses and milling machines, is constantly expanding its product line with new machines for more efficient production. Literature on the following Benchmaster equipment is available giving complete details. Write for your copies today!



NEW BENCHMASTER 10 TON DEEP THROAT PRESSES Series 100

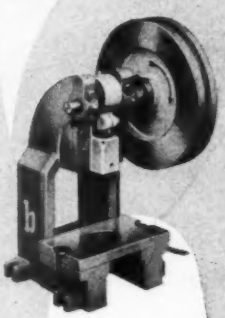
Available in 3 new models with standard strokes of 1¼". Other strokes available from 1½" to 3". Center of slide to frame 12". Shut heights are obtainable from 7" to 13" depending upon model number and stroke length desired.

OTHER BENCHMASTER MACHINES

PRESSES: Benchmasters are available in 2, 5, 8 and 10-ton capacities in the following types: Plain OBI, Deep Throat, Fixed-Bed Gap Frame, Back Geared, Half-Press and Multiple Ram.

MILLS: Benchmasters quickly convert from horizontal to vertical milling by exchanging spindle quill assemblies. Precision performance at minimum cost!

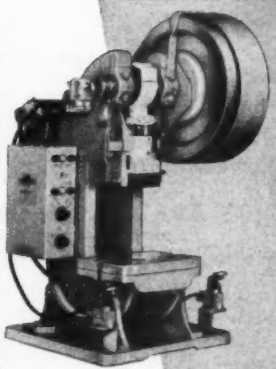
ACCESSORIES: For Presses and Mills; Roll Feeds, Cage Guards, Floor Legs, Rotary Tables, Swivel Vises, Arbors, Collets, Pedestals, etc.



BENCHMASTER 2 TON FIXED-BED GAP FRAME PRESSES

A new Benchmaster with a 4½" column spacing for feeding foil and other wide materials! For fast, efficient light manufacturing or assembly. Typical Benchmaster quality...adjustable gibs, improved sliding key-type clutch, husky frame, replaceable bronze bearings, etc.

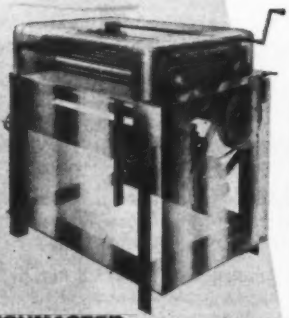
BENCHMASTER ELECTRO-MAGNETIC CLUTCH



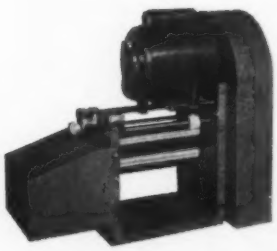
Insures instant pickup or disengagement at any portion of the stroke. Permits application to flying cut-off operations or automation of several presses from a single control source. Smooth and relatively noiseless, no sliding keys, no breakage hazards due to shock, excellent safety. Controls for manual, foot, 2-button hand, remote or automatic operation.

NEW BENCHMASTER STRAIGHTENING MACHINES

Now furnished in several series with choice of 9 or 11 rolls for handling all types of coiled stock from soft aluminum to tempered steels. Roll widths up to 36". Thicknesses up to .200". All models equipped with pinch rolls at feed or feed and discharge ends. Also available with or without magnetic clutch and brake.

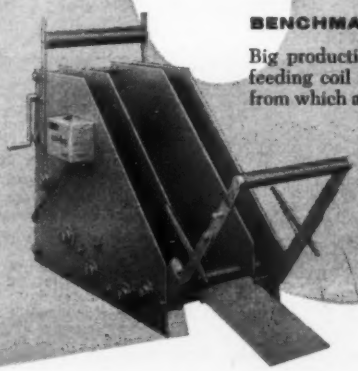


NEW BENCHMASTER AUTOMATIC MOTORIZED FEEDS



Equipped with new Benchmaster Electro-Magnetic Clutch and Brake, can be used with presses, shears, etc. Built-in electric measuring device feeds any required length before automatic shut-off. Also available with external microswitch and fixed stop for automatic shut-off. Roll widths up to 36", thickness capacity ⅛". Other specifications on special order.

BENCHMASTER KOIL-KRADLES



Big production booster for all machines feeding coil stock. Supplies a slack loop from which any machine can freely draw without pulling against the weight of a heavy coil. Equipped with Benchmaster's Variloop control which eliminates constant motor starts and stops, insures longer life. Can be supplied in Koil-Kradle Straightener Combinations.

benchmaster

World's largest manufacturer of small punch presses and mills.

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CIRCLE INFORM-A-GRAM KEY NO. 104

Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24″ range to limits of less than .0001″. No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!

Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6″ and 12″ models for smaller jobs, to the 18″, 24″, 36″ and 48″ models for larger inspections. Precision-made risers in 6″ and 12″ sizes, such as the 12″ model for the 24″ PLA-CHEK shown above, may be used with all PLA-CHEK Gages.

Cadillac GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

MAIL THIS COUPON FOR COMPLETE DATA

CADILLAC GAGE COMPANY
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Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

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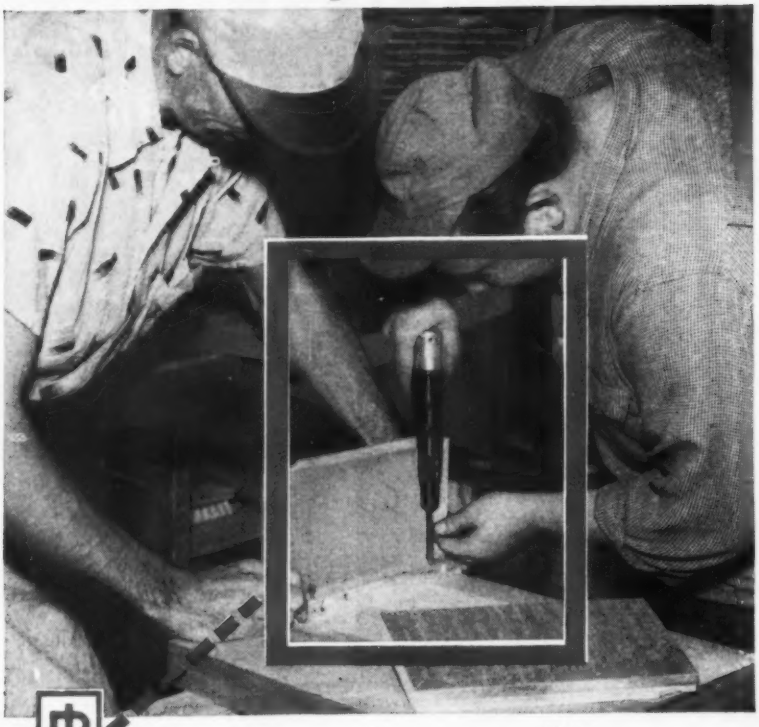
Company _____

Address _____

City _____ Zone____ State _____

CIRCLE INFORM-A-GRAM KEY NO. 105

is there a COST-SAVING idea in this picture for you?



air-powered screw drivers end handwork in close quarters

*Exceptionally small side-to-center distance of this Ingersoll-Rand air-powered screw driver permits running screws that electric tools can't reach and that formerly had to be driven by hand.

AIR engineering at work
REPORT No. 4211.05

The men pictured above are saving $1.35 on a single unit. That's a saving of $87.75 a day for their company. Production has increased 160% since the two men changed from a combination of electric tools and hand methods to I-R Air-Powered Screw Drivers. At this rate, the I-R tools *paid for themselves in 3½ days!*

Can you picture a similar saving in your plant? An I-R AIRengineer, with over 1000 sizes and types of air and electric tools to work with, will gladly analyze your assembly operation and make recommendations without obligation. Write today!

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

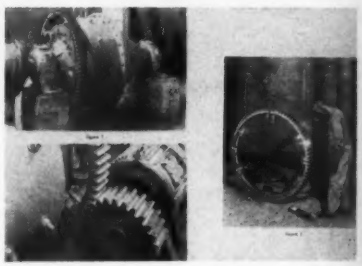
CIRCLE INFORM-A-GRAM KEY NO. 106

GEAR TOOTH LIFE GREATLY INCREASED BY HARD-FACING

An anticipated improvement of over 3400% in gear life through hardfacing has been disclosed. The spur gear in question is used in a ball mill operation (Fig. 1), and the hardfacing material responsible for the improvement in the wearing qualities of the gear is Colmonoy No. 2, an iron-base electrode containing chromium, molybdenum, silicon and carbon.

The ball mill is used to process metallic compounds that contain extremely abrasive ingredients. In the process metallic dust emanates, settles on the driving gears, and decidedly increases gear wear.

The pinion gear, fabricated of hardened steel, resists fairly well the abrasion of the metallic dust deposits (Fig. 2). Original equipment spur gears, however, are too large to economically permit making them of the same material. To hold cost down while providing wear resistant qualities, the ball mill manufacturer produces the spur gears of a special high-grade cast iron. The new gears have unmachined tooth surfaces.



Originally, the spur gear operated but 80 hrs before being worn to the point of uselessness. Other gears were ordered and installed with approximately the same result. In all, a total of four original equipment replacement spur gears were tried but no gear lasted longer than 140 hrs in this service.

It was decided to try hardfacing the spur gear on the wearing face of each tooth. The result was a gear that, after 1760 hrs of operation under identical conditions, showed no visible signs of wear. Based on performance to date, it is believed that total gear life will exceed 5000 hrs. Reclamation of a worn gear by hardfacing is also less costly than purchase of a new gear.

The alloy has excellent abrasion resistance, possesses exceptional weldability, and has a low heat requirement. In addition, its low hy-

drogen content insures a sound casting.

The electrode is applied by D-C arc welding to the wearing face of each spur gear tooth (Fig. 3). The deposit is laid in a series of beads approximately ⅛" thick using a 3/16" dia electrode. Following welding, the deposit is ground smooth using hand equipment. The gear is then ready for installation.

LAPPING TECHNIQUE PROVIDES CRITICAL DIMENSIONS

A new technique for obtaining critical flatness and parallelism in the production of germanium, silicon, quartz, barium titanate, and lead zirconate crystals and wafers has been introduced. A lapping operation on a Lapmaster, in combination with a specially designed diamond fixture, can produce a flatness under 3 light bands, a parallelism of 50 micro-inches, and a thinness of 0.001" on these crystals or wafers.

In the first-side operation, the crystals or wafers are lapped with little or no fixturing. In this operation, they are worked to approximately 2 light bands (0.0000232").

In the second-side operation, the blanks are secured to the diamond fixture for finish lapping. This triangular steel plate, finished to a flatness of two light bands, has adjustable diamond stop points at each leg to limit the travel of the fixture in the cycle. The diamond stops can be set to micro-inch accuracy to provide the desired crystal blank finish thickness. The diamond points, being extremely resistant to aluminum oxide abrasive, act as positive stops thus predetermining the lapping operation to the limit set within the range of the abrasive particle size.

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can help you save time, money and improve product quality
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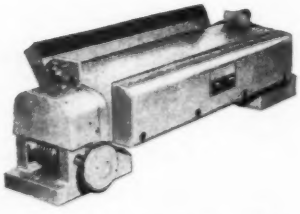
CIRCLE INFORM-A-GRAM KEY NO. 107

"We recommend it to our many customers"

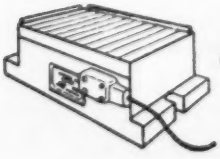
"Magna-Lock MAGNETIC FIXTURE has proved most efficient for sharpening our Shear-Speed Gear Cutter blades in the field" says Michigan Tool Company, Detroit

Each individual blade must be sharpened accurately. Each must be exactly like all the others in the set. The Magna-Lock Magnetic Fixture securely holds the set in correct alignment. The angular bar provides correct end position for the heel of each blade. Side-by-side alignment is made with the knurled screw. Rotational adjustment with vernier setting permits repetitive sharpening at the same correct angle and maintenance of the original form of the relieved tooth throughout the life of the blades.

Your holding problems, too, can very likely be solved by a standard or a special Magna-Lock electromagnetic chuck or holding device. It will pay you to secure full details *now*. Write Dept. TP-117.



Magna-Lock precision compound angular magnetic fixture, 6" x 24". Special backstop locator. Rotational adjustment with vernier setting. Knurled screw for side-by-side alignment of work pieces.

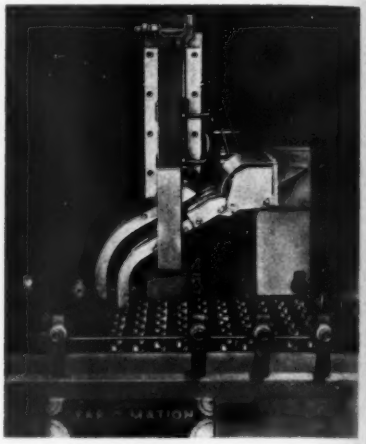


Hanchett MAGNA-LOCK CORPORATION
BIG RAPIDS, MICHIGAN, U. S. A.
Designers and makers of a complete line of magnetic chucks and devices.

CIRCLE INFORM-A-GRAM KEY NO. 108

LONG PINION GEARS BASKETED BY FAST FEEDING MECHANISM

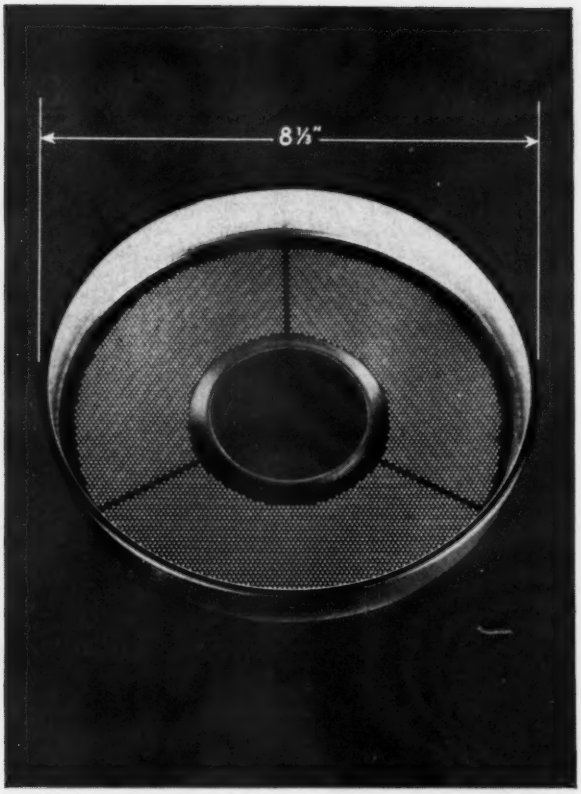
The high-speed method for automatically "basketing" parts prior to, during, or after processing has been extended to long pinions, with a new feeding mechanism. The machine is used to basket 2½" long pinions at a loading rate of up to 2,500 pcs/hr. Each basketing unit is custom-tailored to a specific job, and can be easily modified to load pinions up to 4" or more in length.



In this machine, developed by the Gear-O-Mation Division of Michigan Tool Company, parts are fed to a dropping mechanism through an enclosed track, using chain lifts and gravity flow. Rate of feed is variable through standard interlocked limit switches, and even at high speed it is gentle enough to assure delivery of unmarred parts.

Five rolling parts (one row of the basket) are guided and tipped through curved channeled tracks and gravity fed onto upright basket prongs a row at a time. Parts' release is controlled by tilting the curved tracks so that the parts will slide. A hydraulic cylinder, interlocked with the basket index, moves the feeding tracks from the "positive stop" to the "feeding" angle.

Empty baskets enter the loader on a chain conveyor and are horizontally positioned by spring clips. Vertical positioning is assured by locked roller-guide retainment. Indexing of the basket is accomplished by limit switches triggered by the chain drive. This arrangement is self-controlling, as the end of the run or a malfunction at the loader will stop the equipment. Service is facilitated by easy-to-reach assemblies, JIC circuits, and minimum lubrication requirements.



WHICH DIE STEEL WOULD YOU USE

to be sure of getting 6,066 perfect holes in this die?

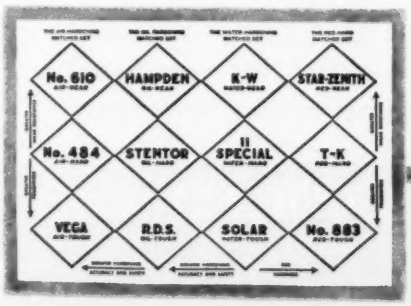
These tools are used in a 60-ton press to pierce 6,066 holes of .036" dia. in aluminum filter pans for a popular home appliance. The job demands "almost everything" from the die steel . . . good machinability and uniformity, minimum size change, extra safety in hardening and toughness to withstand heavy press loads.

The filter pans are 8⅓" in dia., and .025" thick. The 6,066 holes are perforated in three blows, as the die moves through three 120 degree indexing stations. Hundreds of machine hours are involved in drilling and taper reaming the tiny holes.

If the decision were up to you . . . on which die steel would you be willing to stake your reputation in view of this tough set of requirements?

In this Field Report from customer files, here are the amazing results: Working with Carpenter VEGA (Air-Tough) Die Steel, the company reports that not a single "hard spot" was encountered . . . *all 6,066 holes are in the die as planned.* The machining of VEGA was "considerably easier" than the machinery steel used for the stripper plate. What's more, there was no discernible change in size or shape after heat treatment . . . *the die held perfectly!*

You can count on good results from any Carpenter Matched Tool and Die Steel. Take the risk out of your tough tooling jobs. Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor now for immediate delivery.



Carpenter STEEL

Matched Tool and Die Steels

The Carpenter Steel Co, 106 W. Bern St., Reading Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

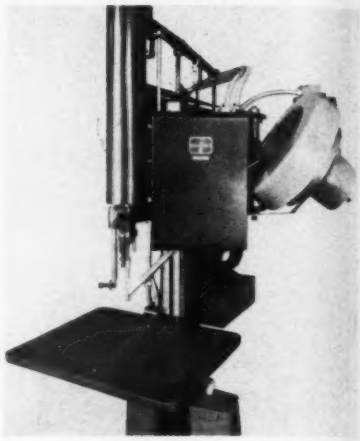
CIRCLE INFORM-A-GRAM KEY NO. 109

SOCKET SET SCREWS NOW AUTOMATICALLY FED AND DRIVEN

A special Bristol feeding unit, adapted to a modified Detroit Power Screwdriver, makes it possible to automatically feed and drive up to 1800 standard socket set screws an hour. The machine handles standard, unmodified socket set screws in either hex or multiple spline socket types, and with any of the standard points, reports the Socket Screw Division of The Bristol Co. Screws in diameters down to No. 2 wire size and up to ⅝" dia can be driven, with lengths down to and shorter than the diameter.

The feeder unit uses a mechanical type hopper powered by a 1/12 hp motor. This feeds screws at random into an escapement or tube which enters a "selector unit," heart of the machine's orientation system. After the selector receives the screw it indexes about 30°, to a point directly above a feed tube which goes directly to the driver bit. A metal probe "feels" for the end of the screw, to determine which end is up. If the probe strikes solid metal, indicating the point end, the selector rotates 180° and the screw is dropped into the feed tube. If, however, the probe detects the hollow socket, the screw is dropped directly without further positioning. The selector then returns to its original position to receive the next screw.

The selector is capable of faster operation than screws can be driven, so the limiting factor in its use is the rate of presentation of the parts or sub-assemblies to the machine and the rate of driving the screw.



For Sale: Technical Reference-Books

USE THIS AD AS YOUR ORDER BLANK

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Gentlemen: Please send me the books I have checked.

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TOTAL AMT. OF ORDER $ | |

11-57

Just Off the Press

☐ **FASTENERS HANDBOOK** by Julius Soled. 1957; 450 pages. Complete data, illustrations, and descriptions covering all currently available industrial fasteners.
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Open account shipments to rated companies. Otherwise payment with order, please.
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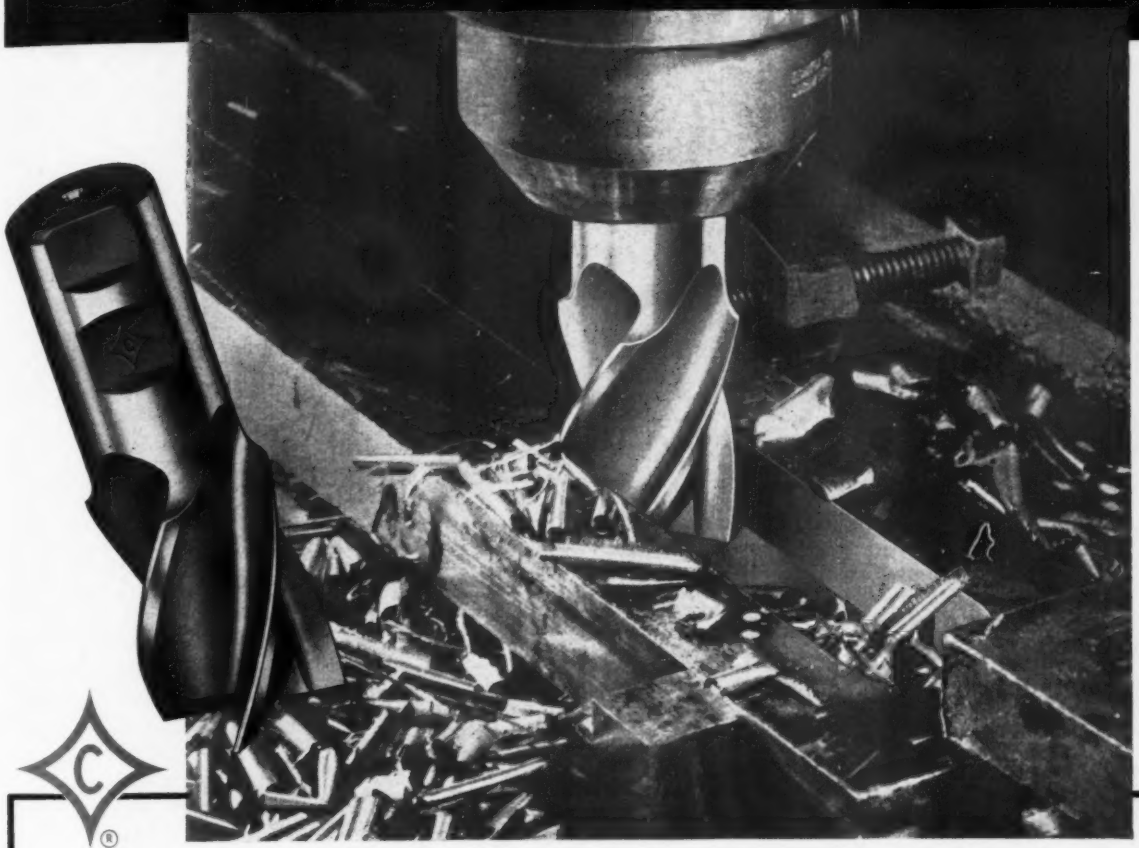
86% More Slots per Grind



CLEVELAND 500 Series 4-Flute End Mills give Better Performance

On the job illustrated above, conventional 3-flute end mills were averaging 50 slots per grind in SAE 1020 steel. On the same set-up CLEVELAND 500 Series 4-Flute End Mills, with less cutting edge wear and longer size life, increased production to *93 slots per grind.* Yet this is only part of the story. The customer reported that these new CLEVELAND End Mills also gave a smoother finish, greater accuracy and better chip removal *without sacrificing speed or feed.* When you use CLEVELAND 500 Series End Mills you get *all* the advantages of 4-flute mills—and plunge cutting, too! Contact your nearest Stockroom, or . . .

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Request your copy of this helpful, informative book that shows the complete line of CLEVELAND End Mills

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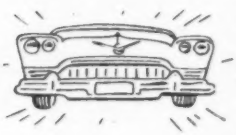
CIRCLE INFORM-A-GRAM KEY NO. 111

Any similarity to a real-life company is purely intentional

How did they use their beans in Boston to cut forming rejects?

A couple of years ago, Otto Motive, super sales engineer of East Boston, Mass., began to eye a new prospect.



Thought he, "As an account, that Supercrate V-8 looks great. They buy a lot of parts. It sure would be peachy — and profitable — to land that plum!"

And, by golly, Otto did get a contract — to furnish wire-wheel units of 25-gauge stainless.

He also got *more* than he bargained for. Sleepless nights, for example. Because — though tempus fugited, production of the wire-wheel units didn't.

It seems that the boys in Otto's shop had trouble forming the hub-cap sections of the units. The stainless scored in the die. Rejects piled up. The scrap pile became something to behold. Delayed delivery dates caused delirium.

Then someone suggested trying dies made from Ampco Metal Grade 24 (a just cause for a raise, if we've ever heard of one!).

Rejects dropped off to practically nothing. Which is no surprise to us. Dies made from Ampco Metal have done as much for many a shop drawing or forming stainless or other clean metals—have made possible real savings.

And they can do as much for *you*. You can count on that!

Ampco Metal dies have an exceptionally low coefficient of friction. They don't load, gall, or scratch the work. They hold close tolerances longer.

You make a better product with fewer costly finishing operations. You cut scrap loss.

You reduce downtime, also. Ampco Metal dies have little or no pickup — you get far longer runs than with steel dies without redressing.

An Ampco stocking distributor near you carries 70 sizes of Ampco Metal die blanks — solid rounds, rectangles, and centrifugually cast rings. Call him.

AMPCO

If you don't know who your Ampco distributor is, write us for his name. *Ampco Metal, Inc., Dept. TP-11, Milwaukee 46, Wisconsin. (West Coast Plant: Burbank, California).*

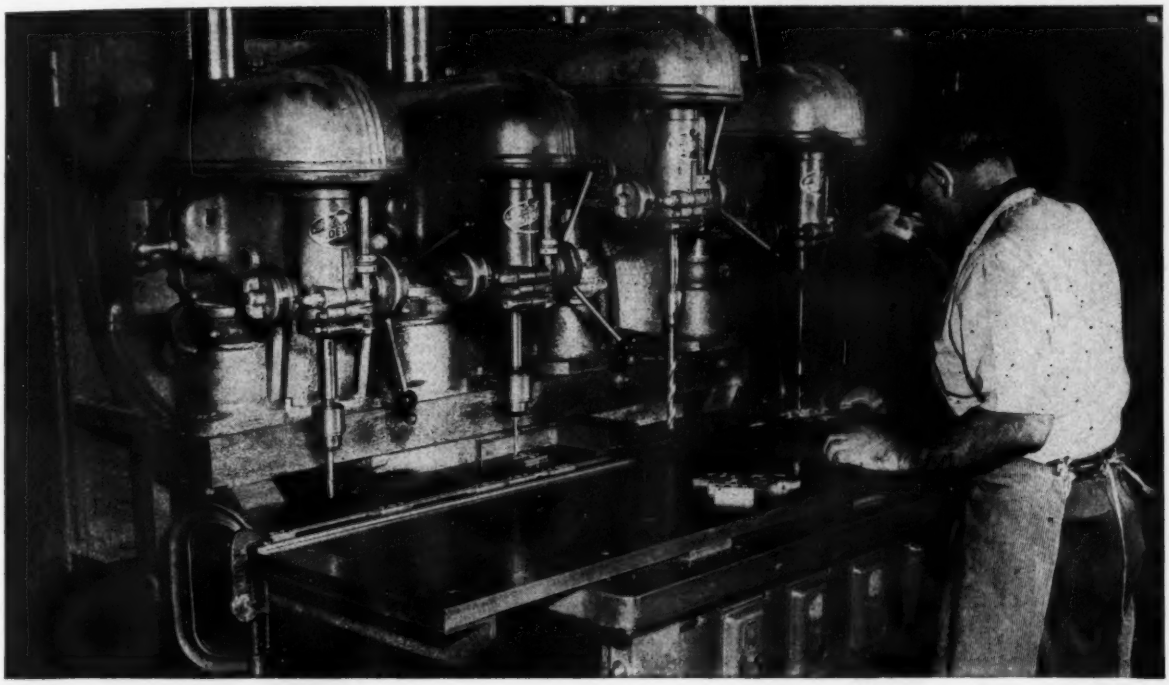
AMPCO METAL

The metal without an equal

RM-6

ROCKWELL-BUILT

DELTA drill presses



. . . save cost of expensive machines

for General Bronze Corp., Garden City, N. Y.

FLEXIBILITY NEEDED—"Producing custom ornamental metal work for architectural use calls for limited production runs and fast product output," says Joe Gafney, Plant Engineer, "and Delta drill presses give us maximum flexibility to meet these constantly changing production demands."

PRECISION AT LESS COST—This Delta drill press set up drills, countersinks and counterbores over 500 bronze window blocks per day, with precision that eliminates costly rejects. And stock Delta power tools provide an inexpensive way to meet peak work loads and prevent bottlenecks.

LONG LIFE, LOW MAINTENANCE—"We have some Delta equipment that has been in regular use for over 15 years," says Mr. Gafney, "and still performs with almost no maintenance. Rugged construction and low-cost maintenance are Delta Quality features we really appreciate."

SEE THE ENTIRE DELTA LINE—Get all the facts on the world's most complete line of drill presses and accessories. Compare for quality, for value—and make up your own mind. Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your telephone book.

Send Coupon for All the Facts!

DELTA ROCKWELL

another product by **ROCKWELL**

Delta Power Tool Div., Rockwell Manufacturing Co.
622L N. Lexington Ave., Pittsburgh 8, Pa.

- ☐ Please send catalog on entire Delta Drill Press line.
- ☐ Please send booklet: Power Tools Teamed with Machine Tools.
- ☐ Please send names of my nearest Delta Dealers.

Name_____ Title_____

Company_____

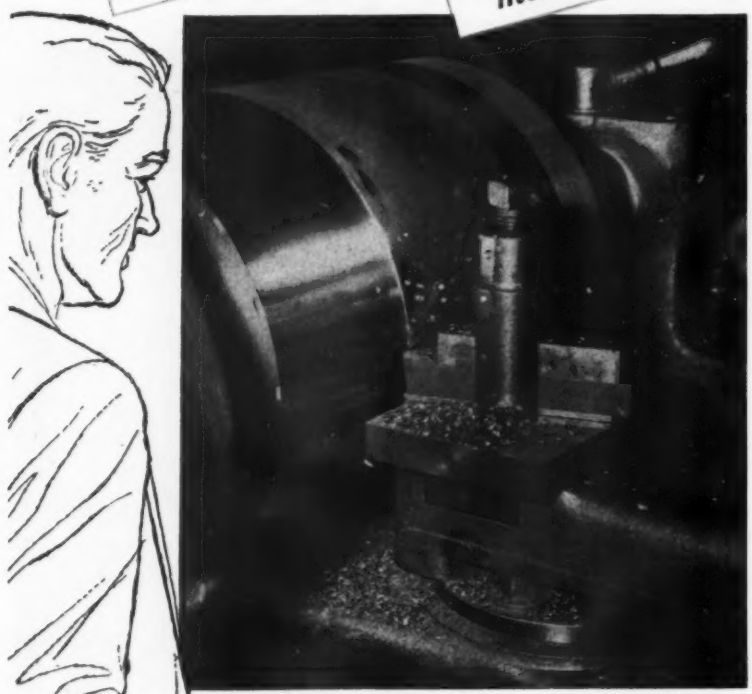
Address_____

City_____ County_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 113

Production increased up to 10 Times!

costs reduced as much as 75%



with

Stupalox®

oxide cutting tools

Again and again the use of these high strength, high density aluminum oxide cutting tools in actual field service has produced sensational results—accelerating production and slashing costs. Field service reports were astounding—*production doubled . . . tripled . . . quadrupled; costs cut 33% . . . 60% . . . 75%!* A triumphant achievement—fully justifying the thirty years which Stupakoff research engineers devoted to its development.

But that's not all. The use of Stupalox oxide cutting tools has also resulted in faster machining cycles smoother finishes, and longer tool life. That's because of the extreme hardness of the tool material which stands up to temperatures of 2000°F and higher, and its resistance to corrosion by the strongest acids and chemicals normally encountered in machining operations. For complete technical data, write for Catalog 257 *today*.

STUPAKOFF DIVISION OF

The CARBORUNDUM Company

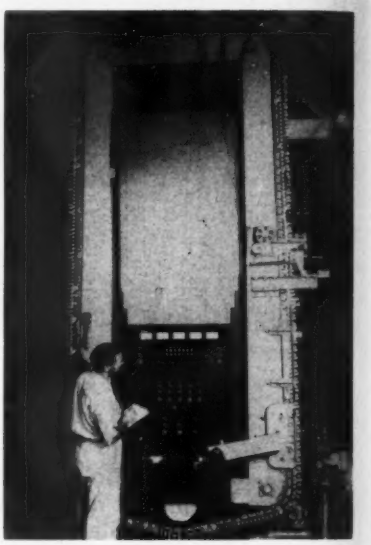
WRITE DEPT. TP LATROBE, PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 114

VERTICAL ALUMINIZING MACHINE PROVIDES 50% SPACE SAVING

A space-saving, 9600-cycle, special vertical motor generator combination control and heating station for preheating and diffusing automotive valves during aluminizing operations has been announced.

The unit, developed by Lindberg Engineering Co., consists of a motor generator, a control station for regulating and controlling the application of high-frequency power, and two heating stations to apply high frequency power to the inductors for preheating and diffusing the valves. A vertical conveyor system wrapped around the 14' high cabinet moves the valves through the various operations and is loaded and unloaded automatically from an overhead conveyor. A metallizing gun with

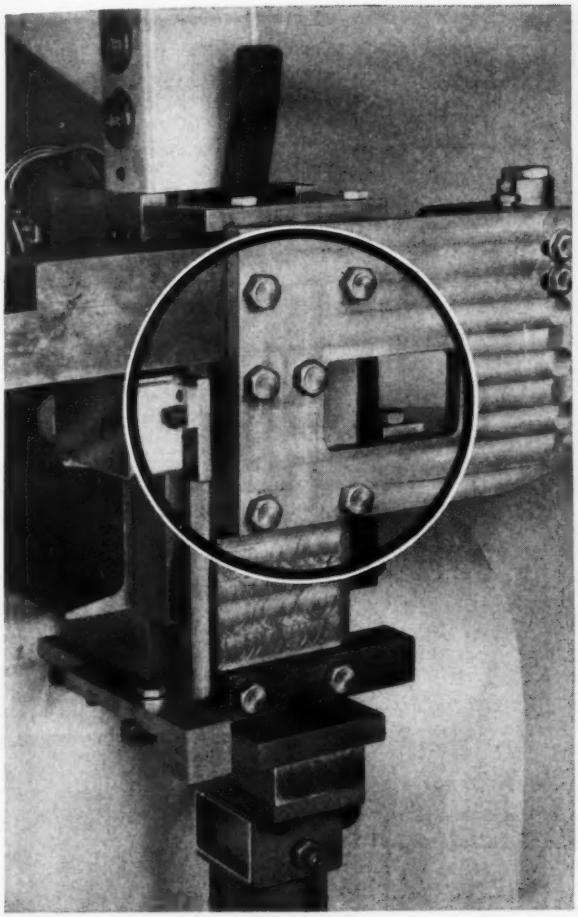


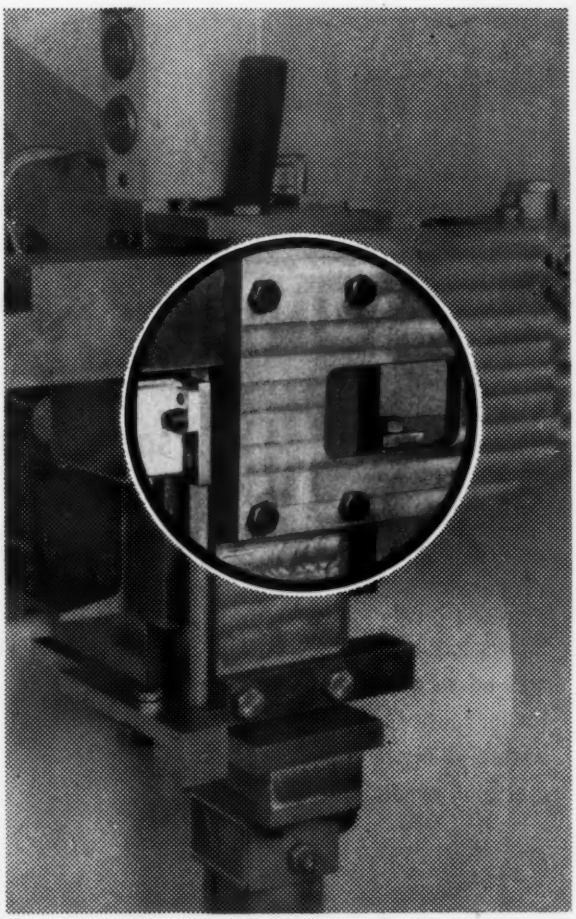
separate control panel sprays the valves with molten aluminum which in the subsequent heating operation forms a hard heat resistant iron aluminum alloy to withstand the high temperatures of the new high powered motors.

A supervisory system of Checklites maintains a constant check on air temperature, water temperature, high voltage interlocks, water flow, and other operating conditions of both motor generator and work stations.

Spindle type work-holding fixtures rotate the valves at approximately 1000 rpm past the metallizing operation and approximately 100 rpm at the preheat and diffusing stations. Variable ratio transformers reduce the voltage from approximately 800 to 4080-v at the preheating inductor,

. . . *Continued on page 116*





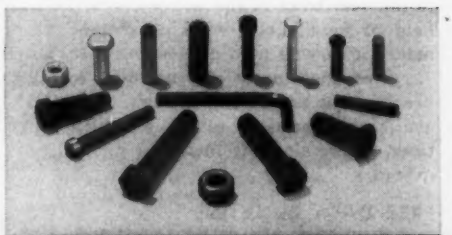
Cuts fastener costs 37% with CHICAGO heat-treated cap screws

Six ⅜" bright cap screws were being used for the support plate assembly of this automatic transfer mechanism. CHICAGO's fastener specialists showed four 5/16" heat-treated cap screws would do the job more efficiently—eliminating two fasteners and substituting a smaller size.

Using heat-treated cap screws here cut total fastener costs 37%! And in eliminating two extra fasteners, important additional savings were made by reducing machining and assembly time.

It will pay you to investigate savings for your products with these stronger fasteners. In addition to their greater strength, CHICAGO heat-treated cap screws provide extra advantages of Carbon Restoration—the special, scientifically controlled process which assures superior resistance to fatigue, wear, shock, and vibration.

Your CHICAGO distributor carries large stocks of heat-treated cap screws. And he will gladly arrange a study of your particular application by our fastener specialists. Call him today.



It pays to standardize on **CHICAGO** FASTENERS

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 115

NEW! BAUSCH & LOMB WIDE FIELD MACROSCOPES 10X to 40X

Handy 'scopes spot-check production, speed small parts work

- Actual size as shown here ... compact, handy
- Shows natural right-side-up views... easier for inexperienced users... a big help in precision assembly!

Just grab this dependable inspection aid for on-the-spot checks of work and materials in any phase of production. Available with folding tripod or sturdy microscope stand, for detailed study and for small-parts assembly. You can even build it right into production machinery!

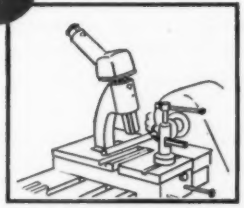
Upright images are sharp and detailed to the very edge of the extremely wide field of view. Long working distance makes it easy to manipulate specimens ... gives operators plenty of room for precision assembly and repairs. (Also available as straight tube for applications where upright image is not required.)

FREE DATA BULLETIN!
ON-THE-JOB DEMONSTRATION!

Find out how this inexpensive production tool can lower your manufacturing costs. WRITE, WIRE or PHONE today for free demonstrations and Data Bulletin D1052. Bausch & Lomb Optical Co., 79823 St. Paul St., Rochester 2, N. Y. (Phone: LOcust 3000).

Use it in tripod...

in microscope stand...



...or even built into machinery!

BAUSCH & LOMB
SINCE 1853

AMERICA'S ONLY COMPLETE OPTICAL SOURCE ... FROM GLASS TO FINISHED PRODUCT

... Vertical Machine from page 114

to 80 to 160-v at the diffusing inductor where final heat is applied to provide operating temperatures of 500°F and 1500°F, respectively. No flux is required and valves can be aluminized at a rate up to 3500/hr with the automated loading and unloading method.

THROW-AWAY INSERT REDUCES COST OF JUMP-CUT MACHINING

Severe jump-cut machining problems are being solved by conversion of tooling from brazed carbide tip tools to "throw-away" button insert tools.

Tool costs were cut to one-fifth and turning speed increased as much as 48% in rough turning and boring AMS 6302 brake rotor segments at Alpha Industries, Inc.

Sixteen of these segments are clamped to a face plate in four stacks. They are turned to 13⅜" dia in four passes at ¼" depth of cut and 0.007" feed. Segments are now turned with Kennametal's standard Kendex tools and K21 inserts. These square inserts with eight cutting edges are good for machining 384 pcs, 48 segments per edge. Inserts cost $1.75 and the holder is prorated conservatively over 10 inserts, to a cost of $1.15 per insert.

Tool cost per 100 pcs is thus 75¢ as compared with $4 with brazed carbide tools. Brazed tool cost was computed from an initial cost of $3.84 plus regrinding costs of $3 for six regrinds. Each tool was good for 168 pcs. The saving was therefore $3.25 per 100 pcs. The figures are similar for the rough boring operation for the 11⅝" ID: 78¢ per 100 pcs with a triangular insert and $4 per 100 pcs with a brazed tip tool. The two operations are done successively on a Midland lathe of 5 hp.

CIRCLE INFORM-A-GRAM KEY NO. 116

PDC "AUTOMATIC"

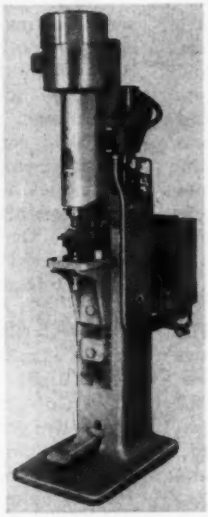
INDEX TABLES—ASSEMBLY PRESSES—RIVET SPINNERS—SPECIAL MACHINES

PDC-AM14 "AUTOMATIC"
Geneva Motion Index Table
Index Time ⅓ second
Accuracy ± .001 inch
3, 4, 6, 8 or 12 stations as ordered.

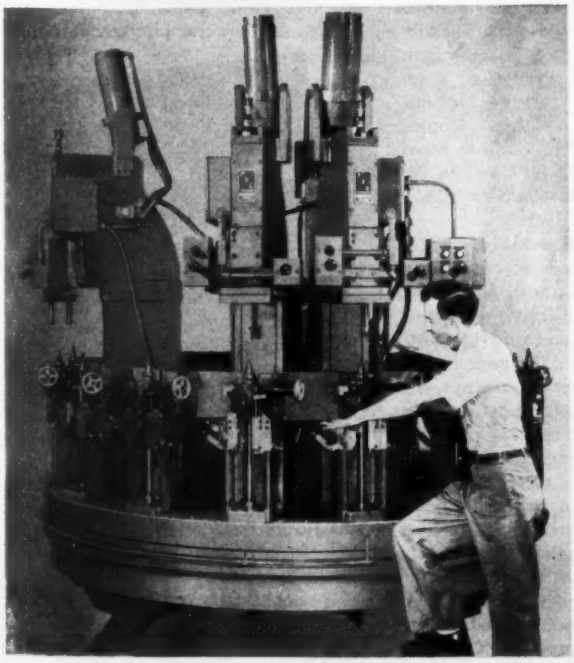
PDC-AM24 "AUTOMATIC"
Geneva Motion Index Table
Index Time ½ second
Accuracy ± .001 inch
16 to 36 stations as ordered.

PDC-EMD26 "AUTOMATIC"
Geneva Motion Index Table
Index Time .2 seconds
Accuracy ± .002 inch
3, 4, 6, 8, 12 stations as ordered.

PDC "AUTOMATIC"
Assembly Press
Press heads up to 6 tons.



PDC-AT 222 "AUTOMATIC"
Rivet Spinner
Rivet Spinner with 2" stroke and ½" Dia. rivet capacity in steel. Head only available for special machine application.



96" Dia., 16 station, "Automatic" assembly ring and base, assembly presses, and 16 holding fixtures. Indexing time 3 seconds.

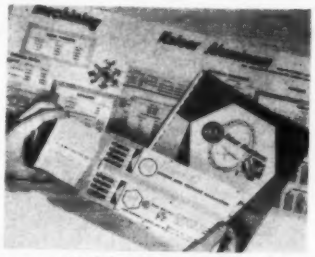
Send engineering information on your requirements for immediate quotation on automated assembling equipment

PRECISION DETROIT CO.
20100 Sherwood Detroit 34, Michigan
TWinbrook 2-5331

CIRCLE INFORM-A-GRAM KEY NO. 117

SHOP AIDS

Three Informative Aids for screw machine operators, shop management, and metal buyers are now available. They include a guide for machine feeds and speeds, a quantity-weight slide rule calculator, and a manual of basic information on machining aluminum. The guide furnishes a reference for the approximate cutting speeds and feeds for aluminum with standard automatic screw machine tools. The calculator gives the lbs/1000 pcs of hexagonal and round stock ranging in size from ⅛" to 1¾". These aids



are supplied by Kaiser Aluminum & Chemical Sales, Inc., Box SMS, 919 N. Michigan Ave., Chicago 11, or—**Circle Inform-A-Gram No. C1.**

Properties Information on Multimet alloy is contained in a 24-page booklet. Included is stress-rupture strength, short-time tensile data, and fatigue and creep data. A separate section of the booklet describes methods for welding, forming, and machining the alloy. Copies of the booklet can be obtained from Haynes Stellite Co., Div'n of Union Carbide Corp., 30-20 Thomson Ave., Long Island City 1, N. Y., or —
Circle Inform-A-Gram No. C2.

The Air Engineering Data File covers engineering and test facilities for propeller fans, specifications, construction, maintenance, and installation. Helpful tables for estimating air-handling requirements, entrance and elbow losses, and duct sizes are found in this folder. Also included are specifications for special application equipment. Copies of Bulletin E-57 are available from Aerovent Fan Co., Inc., Piqua 73. O., or—**Circle Inform-A-Gram No. C3.**

"How to Straighten Pipe and Tube" discusses the problem of straightening and the possible ways of accomplishing the job. Suggestions for various types of jobs are described and illustrated, and the types of equipment used by several companies are given. Instructions are presented for the models of M-H straighteners, and diagrams are included. Copies of this Technical Bulletin 55-A are suplied by Mackintosh-Hemphill, Div'n of E. W. Bliss Co., 901 Bingham St., Pittsburgh 3, or—**Circle Inform-A-Gram No. C4.**

"Recommended Practice for Repair Welding and Fabrication Welding of Steel Castings" is a revised and extended book. It presents methods and quality control welding of steel in relation to castings, cast-weld construction, and composite fabrication. Special operational techniques are included. Copies of this book are being distributed by Tempil® Corp., 132 W. 22nd St., New York 11, or—
Circle Inform-A-Gram No. C5.

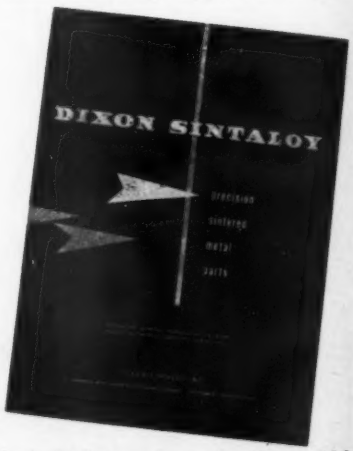
A Wall Chart showing all AISI grades of cold finished steel bars has been made available by LaSalle Steel Co. This 5-page comparison chart lists the 241 grades of steel bars, machinability ratings, and includes a table of weights. Copies may be obtained from LaSalle Steel Co., P. O. Box 6800-A, Chicago 80, or—**Circle Inform-A-Gram No. C6.**

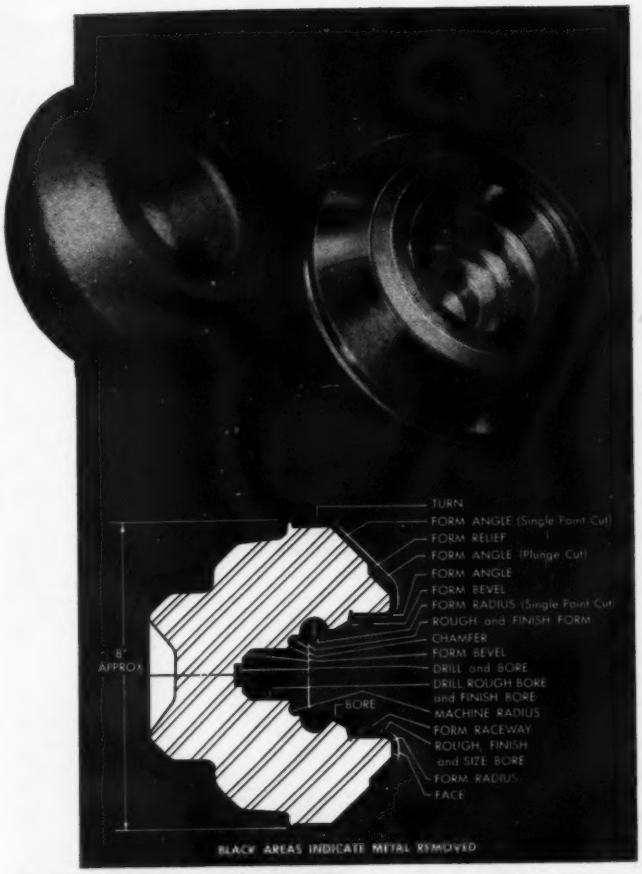
"Automation in Assembly," a 24-page booklet, discusses assembly problems of varied industries, cites basic questions and answers about multiples, details planning of bolt-spacing patterns and arrangements. It describes regulator mountings, air supply, suspension, maintenance, and related installation aspects of portable and machine-type multiple-spindle tools. The comprehensive book is illustrated in two colors with on the job photos showing applications of multiples in industry. Thor Power Tool Co., Automation Div'n, Prudential Plaza, Chicago 1, will supply the booklet upon request, or—**Circle Inform-A-Gram No. C7.**

"Time Saving Tips for the Draftsman and Engineer" shows 59 shortcuts to speed drafting and computation work. The section, "Calculating Ideas," contains 10 tips including easy ways of remembering the signs of trig functions, dividing a circle into parts, and locating decimal points. Easy to use, practical shortcuts to formulas and other engineering data are also featured. For your copy of this booklet write to the Reader Service Div'n, Frederick Post Co., 3650 N. Avondale Ave., Chicago 18, or —
Circle Inform-A-Gram No. C8.

For Quick Determination of correct grinding wheel speed, use a pocket size grinding wheel speed selector. This slide-chart will not only determine wheel rpm, but will also find correct wheel diameter in inches or surface speed in ft/min as desired. Write to Simonds Worden White Co., 1101 Negley Pl., Dayton 7, O., for your speed selector.
Circle Inform-A-Gram No. C9.

Advanced Powder Metallurgy for the designing engineer and management personnel is presented in "Precision Sintered Metal Parts." It describes the advantages of Sintaloy powder metal parts, how they are made, and the principles of economical design and production which should be considered. Typical characteristics of available powder metal alloys are given. Request copies of this booklet from Dixon Sintaloy Inc., 535 Hope St., Stamford, Conn., or—**Circle Inform-A-Gram No. C10.**





Let me show you how one of our P & J Automatics

handled this tough steel forging and . . .

COMPLETED 24 CUTS IN 3.31 MINUTES!

Performance, like that shown in "JOB FACTS" at the right, is the result of *many* contributing factors. The ability to handle all these varied cuts – including an intricate single-point internal form cut and a hard-to-machine bevel – takes ingenious tooling like that engineered for this job by P&J Tooling Specialists and a versatile machine with a wide range of automatic speeds and feeds. Removing heavy metal fast takes extra power. Holding close tolerances and producing fine micro-finishes demands high precision and rigidity. The Potter & Johnston 4-U – like every automatic in our complete line – gives you *all* these important advanced-design features.

HERE ARE THE JOB FACTS:

PART: *Cutter Bit*

MATERIAL: *4815 Steel Forging*

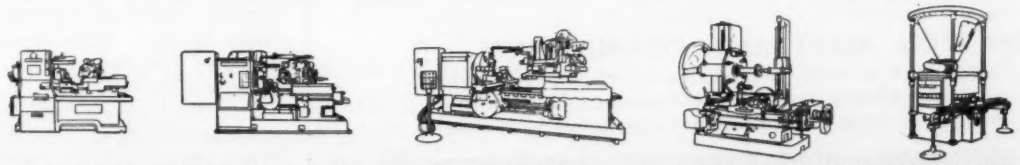
MACHINING REQUIRED: *24 separate cuts, involving heavy metal removal by drilling, boring, turning, single-point forming and plunge cut forming.*

SPECIAL REQUIREMENTS: *Forming a difficult internal radius and bevel angle with both requiring fine micro-finish.*

RESULTS: *All this accomplished in a single, fully-automatic cycle . . . machining time just 3.31 minutes . . . on a P&J 4-U Automatic Turret Lathe.*

Put all these cost cutting factors to work in your plant – by putting your tough jobs on a P&J Automatic with P&J Tooling – to increase output and up-grade work quality.

Let me help you. Just send me your sample parts or prints. Write to Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . GILDA PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

CIRCLE INFORM-A-GRAM KEY NO. 119

Mr. Plant Engineer –

You're responsible for EFFICIENT air supply to pneumatic equipment

Here are
BRAND NEW
high-efficiency units . . . better air service . . . easier to maintain

Delivers really CLEAN dry air

Watts Filter delivers clean dry air to Federal Products Dimensionair.

High-Efficiency FILTER with exclusive "Tornado Action."

Extreme centrifugal force spirals dirt and moisture particles downward into the "quiet zone" leaving in the air only a minute percentage of the finest and lightest particles which are trapped by the filter cone.

Maintains MORE UNIFORM PRESSURE

Watts Regulator maintains uniform air pressure for Scott-Williams KN Knitting Machine

High-Efficiency REGULATOR with highly sensitive "Aspirator Action."

Watts Aspirator control acts directly on the diaphragm, giving instant compensation for fluctuating pressure demands . . . provides precise control and stabilizes pressures reaching individual pieces of equipment.

LUBRICATES perfectly at all flow rates

Watts Lubricator provides efficient lubrication for Markem Machine Company's Model 70AF.

High-Efficiency LUBRICATOR with exclusive "By-pass pick-up."

Watts new By-Pass Pick-Up makes possible a sub-miniature, high velocity venturi section which positively creates sufficient force — even at flow rates as low as one cubic foot per minute — to vaporize oil into a fine mist for uniform, economical lubrication.

BEFORE YOU MAKE ANY COMMITMENTS –

get the facts on Watts new-design units which open up new worlds of efficiency in Pneumatic Operation, Line Maintenance, and Protection of Equipment against foreign matter.

REQUEST CATALOG AND DETAILED SPECIFICATION SHEETS

WATTS REGULATOR COMPANY
SINCE 1875

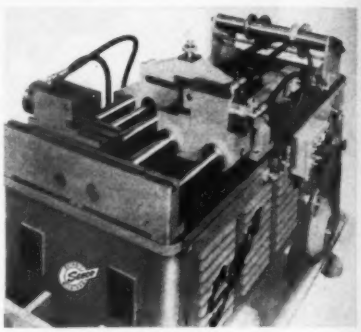
14 EMBANKMENT ROAD LAWRENCE, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 120

CONSTANT PRESS FEED PROVIDED BY SELF CONTAINED TWIN UNIT

This hydraulically-operated, self-contained unit can be readily moved from one press to another. It is compact and rugged and requires a minimum of floor space. The unit can be attached to a press, to feed from the right, left, front, or back, and can be timed to feed-in during any preselected portion of the press cycle. Legs are adjustable for easy leveling.

The Sesco, Inc. twin-cylinder hydraulic gripper feed unit has an unusual cross head arrangement consisting of two grippers, each operated by a hydraulic feed cylinder. The cross head cylinders are sequenced, so that while one gripper grips the stock and moves it forward, the other gripper is returned for the next feed stroke. This faster method of feeding provides not only a greater number of spm, but practically a constant feed.



The condition of the press will in no manner affect the accuracy of the feed. The adjustable hydraulic feed cylinders have a two-piece piston, mounted in tandem, inside each cylinder. These are designed in such a way that the distance between the two pistons can be changed by turning a stroke adjuster handle mounted on the side of the unit. Positive internal stops assure exact duplication of the stroke length. Shock absorbers have been incorporated to prevent impact at each end of the cylinder, and these shock absorbers are effective regardless of the size of the stroke length. The reciprocating action of the twin cylinders helps cancel out inertia.

A hydraulic tank unit assembly serves as the base of this new "Twin-Matic" unit. There is a standard motor and pump assembly mounted with provision for easy access. A rear stock guide assures proper alignment of the stock with the feed assembly, and is adjustable to handle

. . . *Continued on page 122*

Special Punches and Die Buttons

have R-B Standardized Features

Special punch-points and mating die buttons of any shape or size can be made to your specifications and will have all the features of standard R-B equipment. These inherent R-B features include: snap-action radial alignment and vertical locking of special punches and die buttons, speed and ease of insertion or removal, and complete interchangeability. Just a push, a twist and "click" the R-B punch or die button is locked in the retainer—no additional keying required.

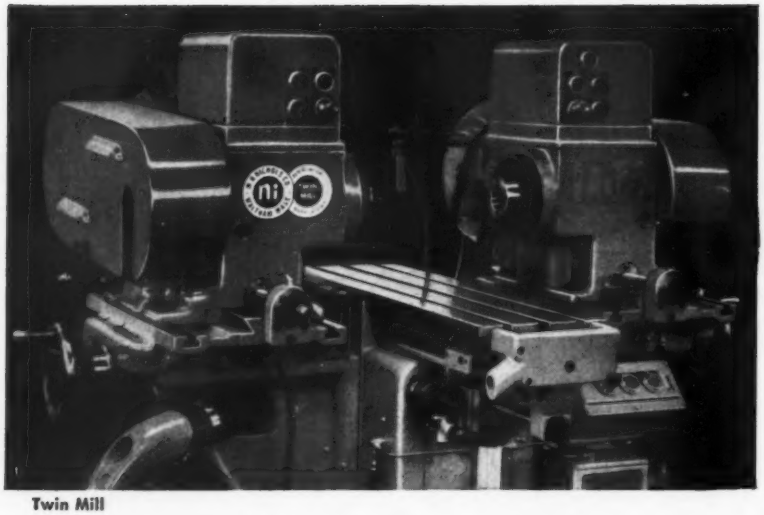
No other manufacturer of punches and die buttons can offer you the amount of successful application experience and the scope of knowledge that is available from the R-B engineering staff for:

- ★ Cutting Your Production Costs
- ★ Reducing Die Designing Time
- ★ Increasing Productivity of Presses
- ★ Supplying Answers to Piercing Problems
- ★ Saving Die Construction Time
- ★ Complete Standardization of Press Tooling

For Additional Information or Engineering Service, Write to:

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 87 • 25476 CAPITOL AVENUE • DETROIT 39, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 121



Twin Mill

NICHOLS MILLERS...

Ideal Basic Machines for Automatic Production

NICHOLS MILLERS are versatile, work-devouring machine tools, unexcelled in accuracy and fine workmanship.

Nichols 85A Semi-automatic

The TWIN MILL is practically TWO milling machines in ONE. Opposed Milling Heads have SIX-WAY adjustability for quick set-up and flexible approach to complex light milling operations. Push a button, and an automatic table cycle gives you TWO completed milling cuts. This unique duplex Miller is a cost-cutter without equal!

For high production precision milling where the double-barrelled approach of the TWIN MILL is not required, there are single spindle NICHOLS Semi-automatic Millers of varying work ranges. In addition to automatic table cycles, synchronized automatic downfeed of spindle head and automatic cross feeds are available.

NICHOLS MILLERS have a magnetic attraction for the Tool Engineer's ingenuity.

Write for literature and illustrations.

A NEW 16 mm. sound, color movie is available for free showing. May we reserve it for you?

Manufactured by **W. H. NICHOLS COMPANY**

National Distributors **THE ROBERT E. MORRIS COMPANY**

REM SALES DIVISION
5007 FARMINGTON AVE. • WEST HARTFORD 7, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 122

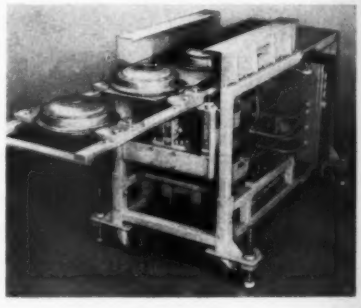
. . . Press Feed from page 120

various stock widths. A front stock guide is provided to guide the stock properly into the die. A stock retainer prevents the stock from slipping backward on the return stroke of the gripper. The control panel is conveniently positioned for ease of operation.

The unit is available with or without a stock oiler, and is adjustable to receive stock widths from 1" to 10" and stock thicknesses to 0.187". The length of the feed can be built to a maximum of 36".

LIFT-AND-CARRY TRANSFER UNIT MADE FOR PRESS OPERATIONS

A lift-and-carry type combination transfer feeding and unloading unit for handling stampings has been designed and built by Press Automation Systems, Inc. This portable, plug-in automation package-unit can be adapted to handle a wide variety of stampings. It can be used to load and unload one press or it can be placed in a line of presses with a continuous transfer bar, to provide a completely automated transfer line.



The unit's lift mechanism operates in a true vertical direction under the control of close-fitted guide bars, for extreme accuracy of location. Both lift and transfer motions have adjustable strokes.

Air cylinders control the motions of the transfer bar in the feeder and unloader. One cylinder raises and lowers the bar assembly; the other controls the forward and reverse motions.

This standard lift-and-carry combination feeder and unloader occupies a floor space about 3' x 8' and is about 42" high. Length depends on press spacing in fully automated lines.

Why the Die Maker Prefers PRODUCTO Die Sets

Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

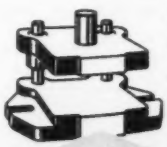
*Patent Pending

He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut



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PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

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NELCO CARBIDE TIPPED MILLING CUTTERS . . . CUT YOUR OVERHEAD!

You DON'T grind steel with a diamond wheel — when you use NELCO Cutters!

All carbide cutting surfaces overhang steel body!

NELCO sandwich braze guarantees a rugged, one piece cutter that works to close tolerances, can't chatter, teeth don't work loose!

NELCO pioneered slash milled design —gives more chip clearance—means less grinding—gives greater production between grinds!

Gang cutting made simple—slot, maintain width with multiple cutters and shims!

Those who buy tools for lasting performance as well as initial appearance always specify "Nelco". These carbide tipped Milling Cutters are precision built for rugged dependability, engineered to "take it"—singly or in gangs —to save *real money*, deliver fast and accurate results without the operational and maintenance "headaches" of most conventional cutters. Look for benefits *and* appearance—call for Nelco—your distributor has the size and type you need in stock.

SEND for the New Nelco Catalog just off the press, showing over 700 Carbide Tipped Cutting Tools.

NELCO TOOLS

For that EXTRA Edge in Production!

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

STOCK OF OVER 3000 STANDARD TOOLS!

Obtain impartial High Speed Steel, Carbide and Carbide Tipped tooling recommendations from your Brown & Sharpe-NELCO Distributor.

CIRCLE INFORM-A-GRAM KEY NO. 124

500% More Carbide Rotary Tools in Use

Use of solid tungsten carbide rotary cutting tools has increased more than 500% in the past three years, the Carmet Division of Allegheny Ludlum Steel Corporation found after conducting a survey recently. Even with this increase, the development of solid carbide rotary tools has not reached its full potential, the survey indicates. Their use is expected to grow rapidly in the next decade.

The company believes the present gain has been brought about primarily through new applications and new designs in the tools themselves. Many rotary cutting tools — mainly reamers and twist drills — which were formerly carbide tipped, they say, are now being made of solid carbide. Tool manufacturers, the survey report indicates, have discovered that for many applications the solid carbide gives better over-all performance at lower cost, taking into consideration the higher initial cost of the solid carbide. Because of this, many tool fabricators are redesigning to utilize the solid carbide.

Reasons for the increased interest in solid tools include the tool manufacturers' desire to get longer lasting tools with fewer sharpenings or regrinds; advanced techniques in powder metallurgy making available better cemented carbides; an unusually high degree of accuracy now available in preformed solid carbide tool blanks; and the increased cost of diamond wheels and the labor to finish non-preformed carbide.

The survey report indicates that the size range for solid preformed carbide tools is in the 3/16" to 3/4" dia range. Economics of producing these tools seems to indicate that it is less costly on tools less than 3/16" dia to grind the flutes from the solid. On tools larger than 3/4" dia, most manufacturers use the conventional tipping method, says A-L. Beyond this size range, however, where high rigidity or high resistance to wear is required, solid carbide would be desirable, they add. The Carmet Division preforms the carbide for tool manufacturers.

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Cracked shaft in Valdosta... His job: get a new one down to Georgia by tomorrow noon. It's an emergency case, but it's not as tough as it sounds.

He's backed by the press industry's largest parts department... by a million dollar parts inventory in two plants... by telephone and Teletype tie-ups between Parts Headquarters in Hastings, Michigan and Toledo and local sales and service centers throughout the country.

Which is another reason why we say, "Bliss is more than a name... it's a guarantee."

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100 years of making metal work for mankind

PRESSES • ROLLING MILLS • MILL ROLLS • DIE SETS • CAN MACHINERY • ORDNANCE

CIRCLE INFORM-A-GRAM KEY NO. 125

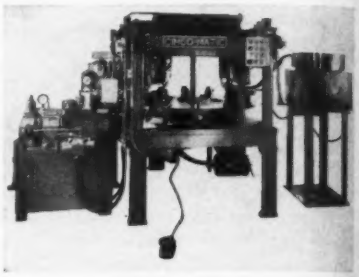
SPINNING OPERATION INCLUDED IN SPECIAL ASSEMBLY MACHINE

Two spinning operations, ordinarily assigned to other specially tooled equipment, are included in the 12-station sequence of this special assembly machine.

The machine, manufactured by the Cimco Engineering Company, has an operating cycle time of six sec permitting a production rate of some 600 pcs/hr at 100% efficiency, and was designed for assembly of the upper ball joint assembly of an automotive steering mechanism. It can handle both the left and right-hand assemblies by interchanging one rest pad and one diamond locator in each of the 12 fixtures, and it can be operated by two unskilled workers.

The spinning operations are scheduled for the sixth and seventh steps of a 10-step operation sequence. At station eight, the spinning unit rough spins a ball joint socket forging over a closing disc while a mist spray lubricates the spinning rolls. At station nine, a second spinning unit finish spins the socket.

Rigid design assures longer spinning-roll life because vibration is eliminated, and the spinning rolls are lowered hydraulically thus insuring positive pressure with maximum control throughout the cycle.



Other equipment in addition to the spinning units includes: two greasing units, a hopper feed unit, and an automatic ejection unit. The machine is equipped with suitable hydraulic pumps, oil reservoir, valves, and necessary pneumatic cylinders and controls.

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offers...

★ CONVENIENCE
★ EFFICIENCY
★ ECONOMY

NEW PACKAGE PLAN INCLUDES:

Boring Bar "4-some Package"...
4 Boring Bars from 7/8" to1-3/4" dia., with Micrometer adjustment. Tool Bit mounted at 53° or 90° angle. Boring range from 1" to 3-1/8" dia.

Sure-Bore Cartridge "Package"...
"53" or "90" pack includes 3 complete assemblies, cartridges, carbide tool bits, wrenches.

Boring Head "2-some Package"...
includes a 2" and 3" head, 2 long and 2 short tool bits... Boring range 2-3/4" to 5-1/4" dia.

WRITE FOR LITERATURE AND PRICES

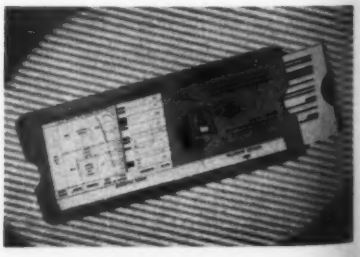
PDQ PORTAGE Double-Quick, Inc.

SWEITZER AVENUE • AKRON 11, OHIO

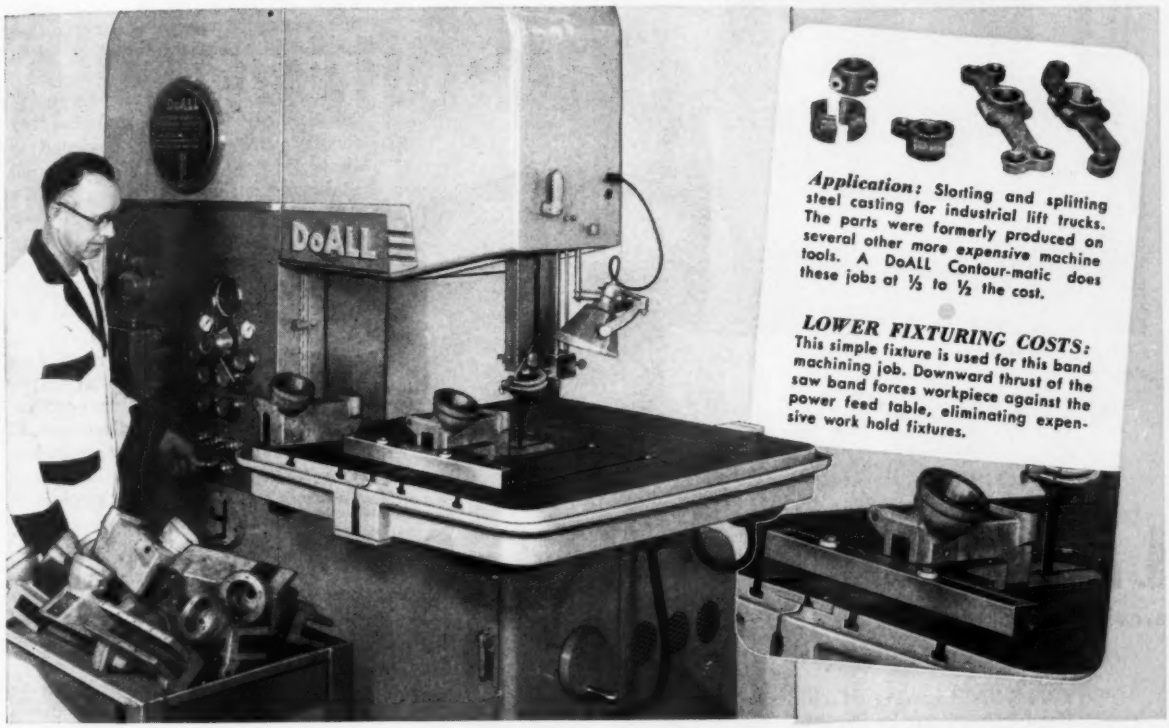
CIRCLE INFORM-A-GRAM KEY NO. 126

PROFILOMETER CHART QUICKLY DETERMINES MACHINING OPERATIONS

The Profilometer slide chart provides a quick, accurate means for determining the right machining operation to use in getting a desired micro-inch finish. Typical applications and tolerances are also given on the same side of the chart. The other side of the chart serves as a compact set of operating instructions. By setting the arrow of the OD or ID to be measured, the chart will show the proper combination of Profilometer equipment to use. For copies of this chart write to Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., on your company letterhead.



Cut Your Slotting and Splitting Costs with DoALL Band Machining

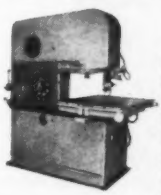


Application: Slotting and splitting steel casting for industrial lift trucks. The parts were formerly produced on several other more expensive machine tools. A DoALL Contour-matic does these jobs at ⅓ to ½ the cost.

LOWER FIXTURING COSTS: This simple fixture is used for this band machining job. Downward thrust of the saw band forces workpiece against the power feed table, eliminating expensive work hold fixtures.

DoALL
high-speed steel
DEMON SAW BLADES

Due to its "red heat hardness" characteristics, this HSS saw (with over 1500 cutting teeth) "slices" through the toughest steel—even titanium—outlasting and outperforming any other saw band. Blades withstand cutting temperatures up to 1100° without losing tooth hardness . . . and last up to 30 times longer than carbon steel blades!



New DoALL
Contour-matic

Standard machine has hydraulic power feed table infinitely variable blade speed, built-in coolant system, high horsepower, plus great rigidity for smoothness and accuracy.

DoALL Contour-matic—Industry's Newest High Production Machine Tool!

The band machining application above is typical of DoALL *speed*, *accuracy* and *low cost*. There are HUNDREDS of other duplicate parts production jobs that can also be handled on the new DoALL Contour-matic—with the same results!

The DoALL Contour-matic has proven itself as the only really NEW machining concept developed in years for cutting slots or splitting parts on a production line basis. What makes it possible? A new continuous-cutting *high-speed steel* saw band that accurately "slices" through any machinable metal in a fraction of the previous time . . . plus a powerful band machine with a hydraulic power feed table that automatically guides the workpiece into the blade. This new "integrated" combination of blade and band machine gives you faster, more economical slotting or splitting of all kinds of precision parts. And compare the lower machine investment with other machine tools. You'll realize why industry is switching to band machining for high-speed duplicate parts production!

Other production applications: Contour sawing, notching, slitting, friction sawing, line grinding or filing. Call DoALL locally today for a FREE "in-your-plant" DEMONSTRATION. Or, write for catalogs describing this new basic machine tool.

Visit our Booth No. 360, Metals Show, Chicago, Nov. 4-8.

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Machines and Blades Surfacer, Grinders Power Saws

CIRCLE INFORM-A-GRAM KEY NO. 127

Production Lapping and Polishing of Parts

SYNTRON Lapping Machine lapping shaft seal components to precision flatness.

SYNTRON Vibratory

LAPPING MACHINES

provide consistent quality lapping and polishing of parts in production quantities.

SYNTRON Lapping Machines save many man hours, and cut production costs by producing metallographic finishes and precision flat surfaces on component parts in production quantities. Their gentle vibration with variable speed control assures a positive polishing action on parts or samples where metallographic finishes are required.

Investigate how SYNTRON Lapping Machines can cut your production costs.

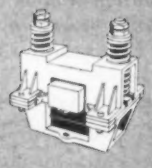
Easily installed—no expensive grinding equipment necessary. Low cost, dependable operation.

SYNTRON announces the opening of a laboratory with facilities for lapping and polishing test samples. Prompt return of test samples with recommendations in 10 days.

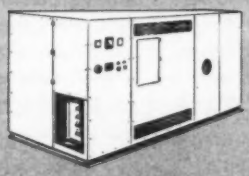
Builders of quality equipment for more than a Quarter-Century.

Other SYNTRON Equipment of proven Dependable Quality

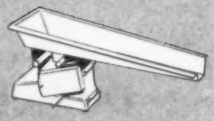
BIN VIBRATORS



AC TO DC POWER CONVERSION UNITS



VIBRATORY FEEDERS



Write for complete catalog data — FREE

SYNTRON COMPANY
341 Lexington Avenue Homer City, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 128

COURSE ON SMALL PLANT AUTOMATION

Editors Watson Nordquist and William Hoffman of TOOLING & PRODUCTION are scheduled as guest lecturers for a forthcoming one-week management training course in "Automation for Small Plants".

Moderated by Richard Felver of the Carnegie Institute of Technology faculty, this course is designed to show how to automate your small plant and cut production costs to the bone. Subjects will include economic analysis and feasibility, advance planning, programming, effects on labor, selling automation to employees, equipment and methods, and feedback controls.

Mr. Nordquist will concentrate on the maximum use of standard, low-cost multi-purpose machine components and will lead a discussion of actual examples of their application. The basic theory and application of pneumatic and hydraulic circuits to the mechanization of common production operations will be presented by Mr. Hoffman. Another session will be devoted to automatic handling equipment, led by Paul Schneider of Schneider Industries, Inc.

This course will be held in Cleveland, November 11-15, under direction of the National Institute of Management, Inc., Cleveland 14. The following week, the Institute will conduct a Small Plant Management course.

TORQUE ACTUATOR INDEXES SPECIAL MACHINE TABLE

This special machine bores and faces 16 of the 12" dia flange openings in a diesel engine oil pan in a 48-min production cycle.

The semi-automatic machine successively finishes eight large holes on one side. Then the boring and facing head carriage is extended to the extreme right position, illustrated, where pressure is applied to the Rotac 6-3 torque actuator (manufactured by Ex-Cell-O Corporation) to rotate the complete table and workpiece 180° in eight sec, decelerating through the last 20° of table movement. The remaining eight holes on the opposite side of the large oil pan are then successively bored and faced to completion. The workpiece is located and clamped

. . . Continued on page 132

Mill·Bore·Shape Slot·Grind·Drill

Here's a new machine that will do all these jobs...and more

...anywhere!

NEW
DUMORE
VERSA-MIL
PORTABLE PRECISION MACHINING
• You gain the advantage of machining where it is most economical
• You increase your machining capacity, accuracy and efficiency
• You save handling, moving, set-up and downtime
• You save space and the high cost of single-purpose machines
Made by the makers of the famous universal and DUMORE TOOL POST GRINDER

The Dumore Versa-Mil is a compact, rigid design, comparatively light weight, *portable* precision machining unit. It performs with extreme efficiency at any angle in any required position or direction, as an independent unit with its own power and feeds, or added to machine tools—lathes, planers, shapers, millers, grinders.

It maintains close tolerances while removing metal at profitable rates on work situated on standard machines, fixed machinery in place, pieces in fixtured set-ups and on parts too big for standard machines. It gives *you* the advantages of machining where it is most economical!

It would pay you to get all the facts about this versatile, new machine tool. Find out all the things it can do and the economies it can give you . . . send the coupon *NOW!*

FOR MAINTENANCE, SHOP, TOOL ROOM AND MASS PRODUCTION USES

GET THE FACTS NOW!

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AUTOMATIC DRILL and TAP UNITS
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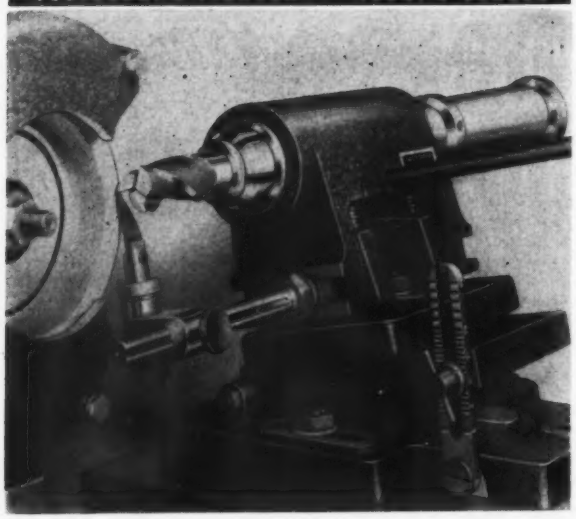
YESTERDAY'S PIONEER · · · TODAY'S LEADER



WELDON
End Mill
Sharpening Fixture

• The Weldon Sharpening Fixture quickly resharpens end mills from 1/16″ to 2″ inclusive. Unnecessary to line up the fixture as it will always grind straight. Designed for any grinder with flat table. No table movement necessary.

Requires little skill to operate. Increases life of end mills and improves their performance.

Write for Circular

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

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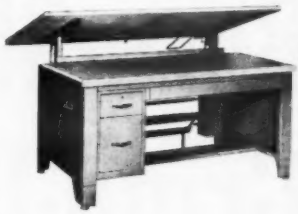
MAYLINE



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Including

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Here's all the stability and accuracy of fine precision equipment in an extremely lightweight, portable form. 25 to 40% the weight of semi-steel units. Easy to handle . . . easy to carry . . . easy to position. Write for catalogs describing this new addition to the Challenge line or see your local Industrial Distributor for full details.

TP-11

THE CHALLENGE MACHINERY CO., GRAND HAVEN, MICH.

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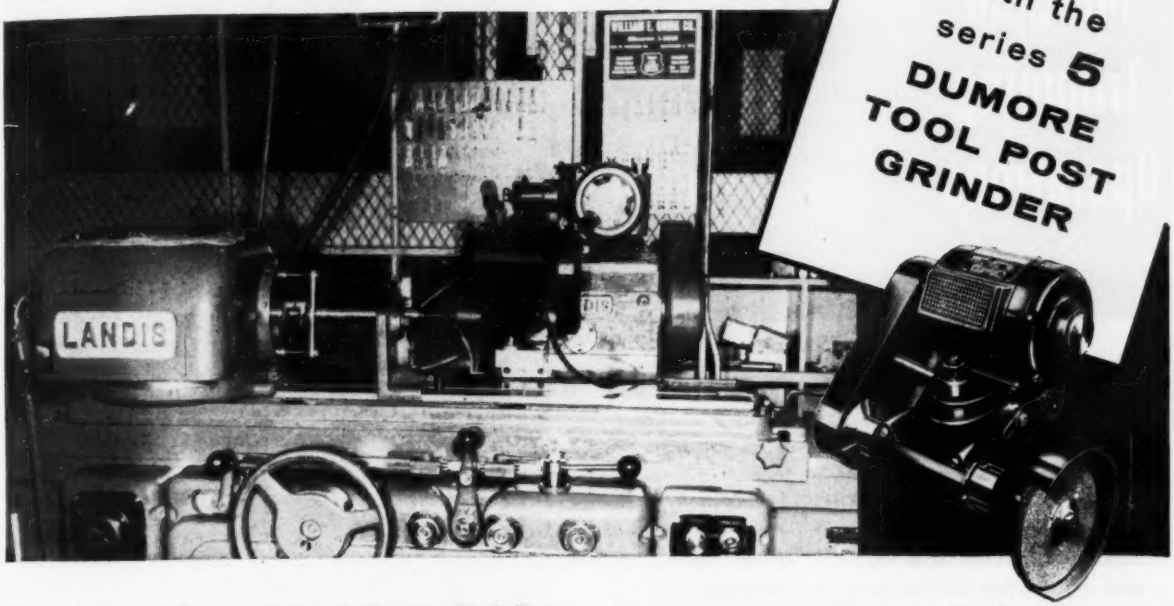
Add Broader Range, Lower Cost INTERNAL GRINDING Capacity to Your Plain or Universal Grinders...



By merely attaching two Series 5 Dumore Tool Post Grinders to the spindle housing on each of two standard grinding machines, a Midwestern manufacturer gained a far wider range of internal grinding capacity at much lower cost than other methods.

The first unit is attached to an old standard grinding machine by means of a simple, angle bracket. *Result:* a long-forgotten machine turned into a high production, precision internal grinder, saving the cost of purchasing a new machine. The second Series 5 unit is added to a brand new standard grinding machine by the same type bracket. *Result:* the company obtained the additional internal grinding capacity needed as well as the external grinding machine required, for less money!

Eleven quick-change quills with available speeds from 4600 to 42,500 rpm and wheel capacity from ⅛" on shallow work to 1⅞" at 18" deep . . . give the Series 5 its remarkably high versatility for hundreds of internal grinding jobs. What's more, the total cost for this equipment is a great deal less than for any other with comparable .0001" accuracy and surface finishes of 6 to 8 micro-inches.

The Series 5 Dumore Tool Post Grinder has a ½ hp distributed field, continuous duty rated universal motor and can handle wheels from ⅛" to 5". You can use it for *both* internal and external grinding operations. Simplified mounting permits you to shift it quickly from one job to the next, or from one machine to another.

MOUNTS ON ANY BASIC MACHINE TOOL . . . planers, shapers, mills, grinders and lathes with 13" to 18" swing . . . to provide precision grinding equipment at low cost. In addition, it can be easily adapted to special-purpose set-ups for special jobs. Eight other models available, 1/5 to 3 hp, for every size of basic machine and grinding job. Write for catalog.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

You can do more grinding with Dumore Grinders on *any* machine tool

DUMORE
PRECISION TOOLS

AUTOMATIC DRILL and TAP UNITS
PORTABLE MILLING UNITS
MICRO-DRILLS
TOOL POST and HAND GRINDERS

THE DUMORE COMPANY, 1304 Seventeenth St., Racine, Wisconsin

DUMORE HAND GRINDERS

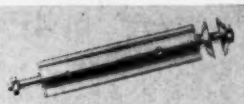
- JOB PROVED over 100,000 in use
- Built best, priced right

Lightweight, compact, balanced to minimize vibration, ample power. 5 models—1/20 to 1/4 hp . . . a grinder for every job.

DUMORE FLEX-SHAFT TOOLS

- QUALITY BUILT FOR LONG LIFE

Lightweight, cool-running hand pieces give sure grip, close control. For grinding, burring, filing, sanding, lapping, chamfering, etc. 5 models.



DUMORE PRECISION QUILLS

Machined from solid bar stock. Close tolerance operation control. Free-running spindles regardless of heat, speed or hours of use. Use with Dumore Grinders or—as heads in special set-ups, as replacement spindles or high speed attachments. 5 basic types.

FOR MORE INFORMATION ON THESE PRECISION TOOLS—WRITE FOR CATALOG

CIRCLE INFORM-A-GRAM KEY NO. 131

Increase output . . . reduce costs!

Costly, time-consuming trimming and notching operations can be done in one operation with a Brehm Trimming Die. Don't worry about stock thickness. Edges will be of full thickness — clean, flat, without burrs or distortion at the trimmed edge.

Other Brehm Die advantages! **Workable Materials** — gold, silver, stainless or mild steel, copper, brass, refrigerator doors, auto bumperbuf zinc, aluminum, fiber, rubber, plastics, **Quantities vary** — Stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Intermediate parts, where stock and scrap can be blown from the die, about 1200 per hour. **Shapes** — fountain-pen ferrules, artillery cases, watch cases, burial vaults, automotive, kitchen, radio and television accessories and parts. Almost anything you need trimmed.

A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations, are eliminated.

Submit part prints for our quotation on shells to be trimmed, or blanked, formed or pierced also.

THE SHIMMY DIE — VULCAN TOOL COMPANY — REGISTERED U.S. PATENT OFF.

Brehm® trimming dies

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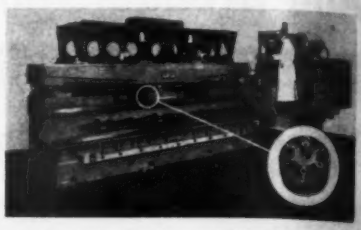
BREHM DIE DIVISION • 741 LORAIN AVENUE • DAYTON 10, OHIO

VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 132

. . . Torque Actuator from page 128



only once; all other positioning is automatically controlled. This machine was designed and built by Snyder Tool & Engineering Company.

The torque actuator is mounted vertically with its shaft fixed directly to the work table. The directly vertical or axial thrust is taken on large bearing surfaces external to the actuator, allowing it to furnish torque only. The inertia of the large mass being rotated is absorbed by gradual decelerating-valve closure.

VIBRATORY FEEDER AND MAGNETIC CONVEYOR INCREASE EFFICIENCY

A better and faster way to automatically convey hundreds of different sizes and shapes of metal buttons, parts, and other small metal objects from hoppers to a rotary power washing machine is provided by a pair of Eriez HI-VI vibratory feeders. One feeder under each hopper automatically maintains a uniform flow of buttons to two 5' conveyor

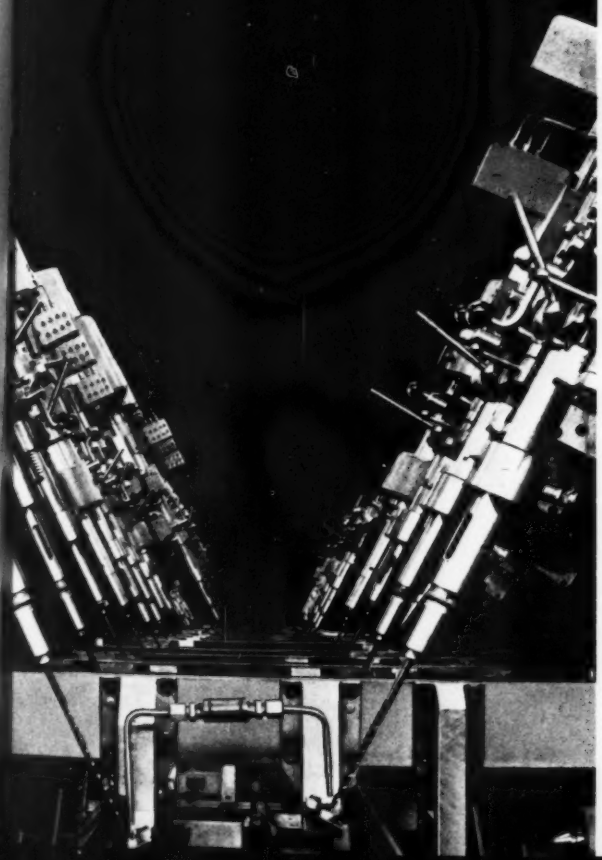
elevators equipped with Eriez Magna-Rails. A powerful permanent magnetic field, acting through the conveyor belt, causes the buttons, etc., to adhere firmly to the belt's surface until they are automatically released at the top of the conveyor.

One operator now handles the output of two hoppers, where previously three men were needed in a slow and tedious manual operation. With the new units, 96 cu ft of parts/hr are handled on both units, as compared with 28 cu ft by the old method.

carbide TOOL NEWS

These suggestions are condensed from Issue #3 of Wesson's publication, "PRODUCTION LINE".

how to cut unnecessary down-time



You can't eliminate *all* machine down-time. Machines do need maintenance and the best of tools can't stay sharp forever.

BUT—

You can eliminate most UNNECESSARY down-time—and it is the unpredictable and unintentional down-time that usually costs the most.

Three main causes of avoidable down-time are: Tool failures, too rapid tool wear, and excessive set-up time.

To minimize these causes we suggest the following as being well worth remembering in selecting, testing, applying, specifying and procuring tools:

For any given job, there is always ONE SPECIFIC carbide grade that is BEST.

Tool Failure

Except for the occasional accident due to hard spots, excess material, momentary power failure, etc., tool failures can be avoided by good tool practices.

The so-called "equivalent" or comparison charts for carbides are deceiving. Time and again, one carbide will stand up on a job while "equivalent" grades break down rapidly. Increase in life of 3 to 1 and 6 to 1 and even more are not un-

(Continued on next page)

WESSON Throw-away Tooling Combines Operations

With **WESSON** "throw-away" tooling, you can cut the number of separate operations on a part by combining several in a single tool assembly. The reasons:

1. Sharpening of complex tools is eliminated
2. Tool-change time is cut way down
3. Ingenious tool designs let you use throw-away inserts in more places
4. Wessonmetal carbides give long life between "tool changes".

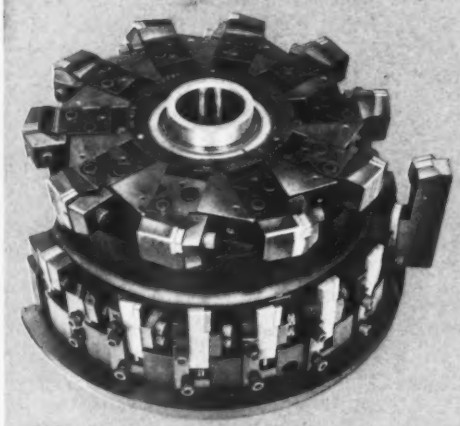


FIG. 1

FIG. 1—An example of how separate operations are eliminated by combining tools. This cutter does the lion's share of the work in producing brake-drums for a prominent 1958 car. The twenty tools include six single point brazed tools with screw adjustment, and 15 throw-away insert types. They rough bore the entire drum, chamfer it, plunge cut a face on the OD and a cooling groove between ID and OD.

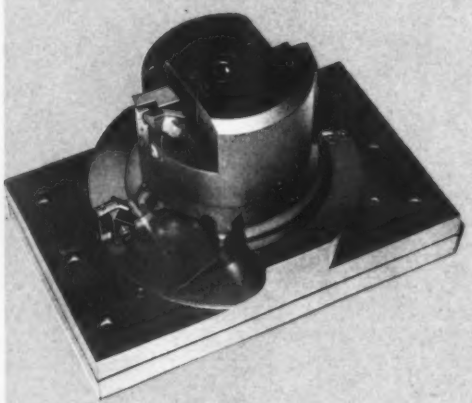


FIG. 2

FIG. 2—Just four identical throw-away tips, ½ inch square, plus one diamond shaped throw-away tip in this tool do all these things on large special pipe couplings: (1) taper bore; (2) relieve; (3) face the end; (4) chamfer the ID; (5) chamfer the OD. Combining these in a single tool has tripled productivity.

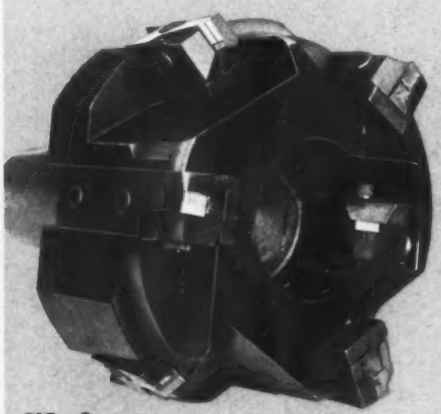


FIG. 3

FIG. 3—Inside a well-known automatic transmission, there is a band-retainer housing with an internal hub. To bore the housing, turn the OD of the internal hub, chamfer the part and counterbore the hub, only one operation is needed. Only one tool is used—a WESSON Multicut boring head. The turning and chamfering tools for the internal hub are micro-adjustable. The entire design is made possible by throw-aways.

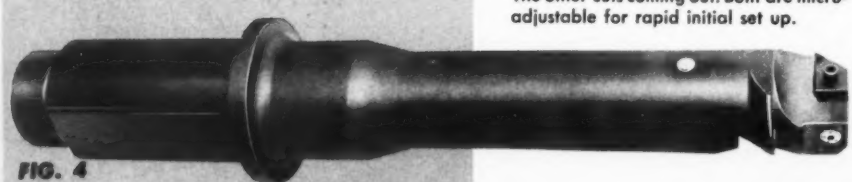


FIG. 4

FIG. 4—There are two opposed triangular Wessonmetal throw-away tips on this tracer-controlled Multicut boring bar. They profile bore the entire complex ID of a turbine part. One tip cuts going in. The other cuts coming out. Both are micro-adjustable for rapid initial set up.

PRODUCTION LINE #3

If you would like a copy of this publication, just jot down your name and title on your company letterhead and mail it to: Editor, PRODUCTION LINE, at the address below.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 JUDGE ROAD, TORONTO 16, ONTARIO

How to cut unnecessary downtime

(Continued from previous page)

usual. The decrease in down-time for tool changes is in proportion of course.

Tool Life

The same factors hold true for tool wear. Time and again tests show even so-called equivalent grades varying as much as 2: and 3:1 and up, in pieces per grind—without any variation in feeds, speeds, depth of cut, etc.

Obviously on-the-job tests are an important factor in specifying the *best* carbide grade for the job.

Set-up Time

When tooling up, it pays to consider what type of tool will give you minimum set-up time when changing tools. Frequently **WESSON** throw-away tooling will cut down-time enormously. When tool change is necessary you release the insert with a twist of a hex wrench. Index the insert to a new cutting edge. Clamp it with another twist of the wrist. You're ready to go—with the least possible machine time lost.

How to do it

To cut unnecessary down-time, what is needed is a plant-wide cost reduction program that seeks to cut down-time through improved tooling practices.

You can simplify and speed such a program in your plant. Wesson's unique in-plant-engineering service has never yet failed to produce major cost reductions. The same service is available without cost to you on a plant-wide program basis.

Litho in U.S.A.

Jacobs
CHUCKS

Superior performance is the result of the painstaking production of superior parts.

Jacobs and your industrial supply distributor deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

The Jacobs Manufacturing Company
West Hartford, Connecticut

The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.

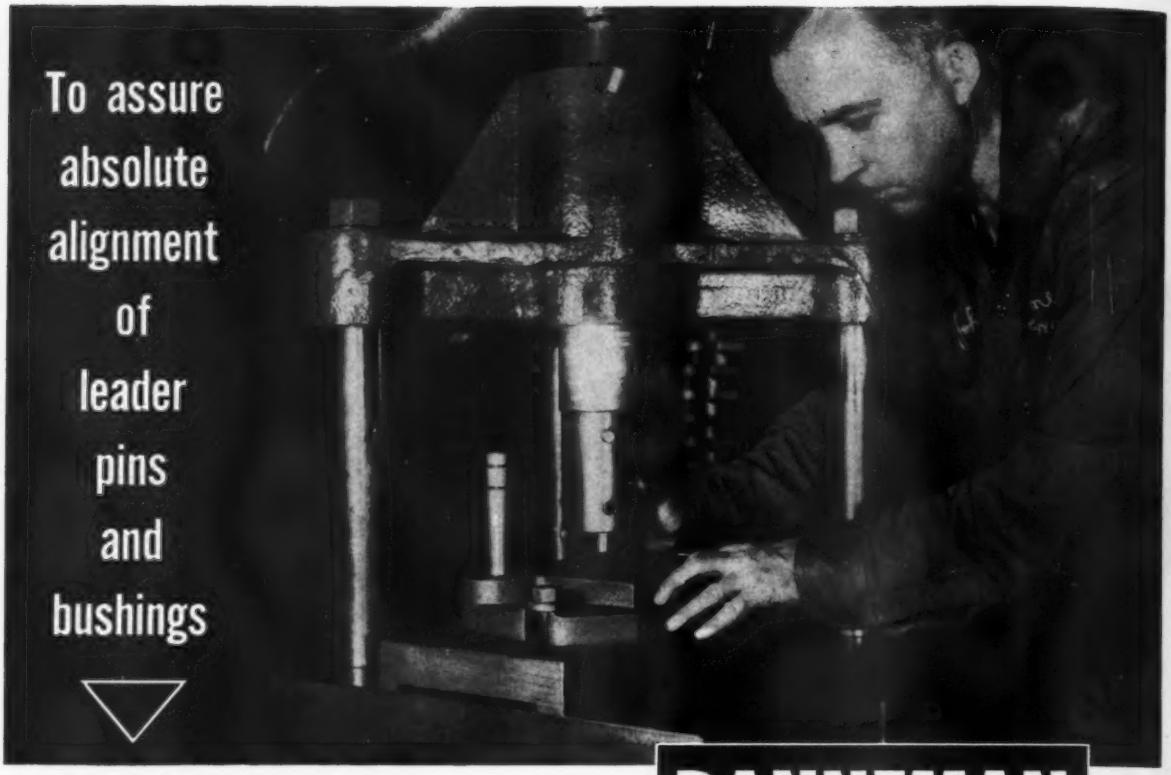
The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

The Jacobs Model 96 Collet Chuck for grinding machines, millers and jig-borers.

The Jacobs Rubber-Flex® Tap Chuck designed for tapping heads and impact tools.

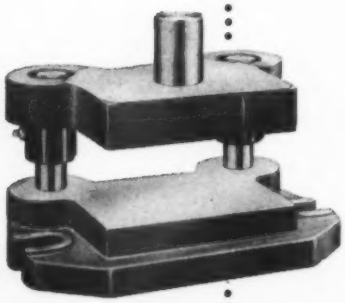
The Jacobs Impact Keyless Chuck especially designed for the aircraft industry.

The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.



They're assembled on cylinder square fixtures

DANNEMAN
PRECISION
DIE SETS



The inherent precision of Danneman die set design and manufacture allows Danneman customers to concentrate on the *larger* task—the die itself. For example, they like the flanges all around that give extra strength and additional clamping area. They recognize the importance of complete interchangeability between any die shoe or punch holder—which Danneman achieves by precision boring on master plates with Moore jig-boring machines and De Vlieg microboring tools.

Customers also like the fact that in Danneman die sets the die space is in even inch increments with the shank located on the center of the die area—that hardened and ground leader pins are spaced for maximum stability and still allow blanks to fall through when in an inclined position.

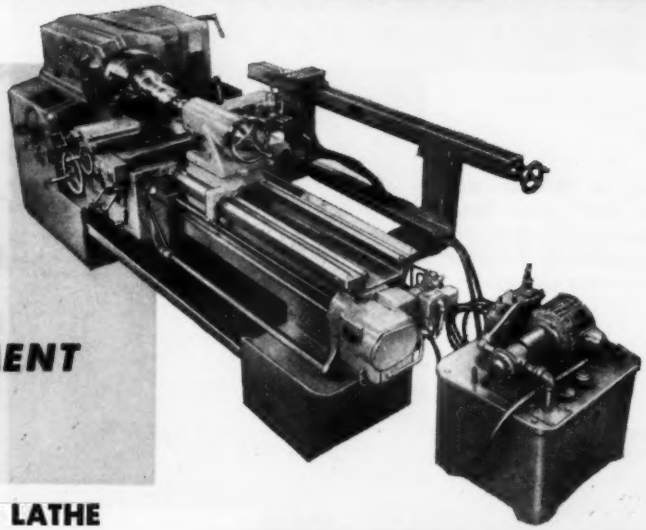
Next time, specify the Danneman precision die set available for your purpose and extra convenience—or we'll design and build to your specs. Complete catalog on request.

DANNEMAN
DIE SET DIVISION

ACME-DANNEMAN CO., INC.
Sales Offices: 45 West 18th St., New York 11, N. Y.
ALgonquin 5-7150 *Works:* 203 Lafayette St., New York 11, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 136

Turchan introduces Trace-Matic

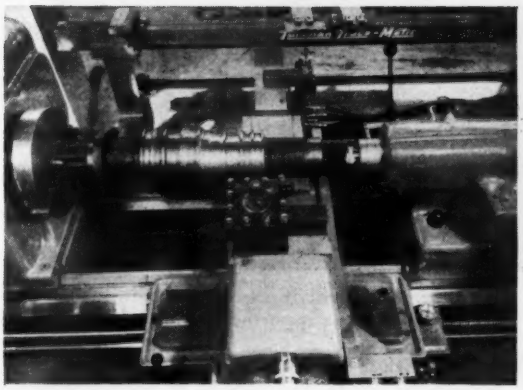


THE NEWEST, MOST REVOLUTIONARY FULL SWING TRACER ATTACHMENT FOR LATHES . . .

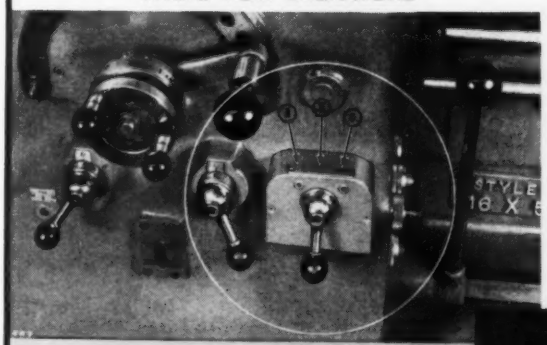
- DESIGNED FOR YOUR LATHE
- UNRESTRICTED SWING
- SIMPLIFIED CONTROL PANEL
- CARRIAGE MOUNTED CONTROLS

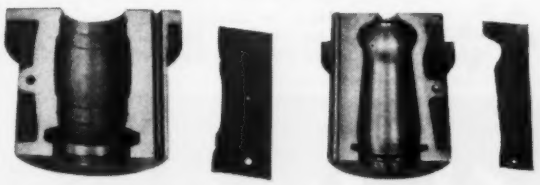
Turning large or small work on large or small lathes and obtaining 90° shoulders, opposing shoulders, tapers, radii and many other forms is simple with Turchan's new Trace-Matic Lathe Attachment. No re-chucking or re-centering is required. Duplication is uniform and continuous. Precision boring or turning is possible with uninterrupted cuts. Finish is excellent.

WRITE FOR LITERATURE



This rugged unit eliminates vibration and distortion—permits unrestricted swing—without additional slides. Tracer controls both longitudinal and cross feeds simultaneously to produce a constant feed rate regardless of contour.





Typical bottle molds bored with Trace-Matic

ONE LEVER CHANGE-OVER

(A) Standard Lathe Operation
(B) Tracing Operations
(C) Standard Thread Cutting

Effortless return to standard lathe operation.

Turchan

OUR 25TH YEAR

TURCHAN FOLLOWER MACHINE CO.

P. O. BOX 6055 • DEARBORN 9, MICH.

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F-G-M STORAGE PLANNING
...GETS MORE INTO LESS SPACE
...CUTS HANDLING TIME SHARPLY!

Up to 75% savings in floor space have been realized by conversion to Rotabin planned storage!

F-G-M Warehouse Racks 9 feet wide for heavy loads.

Operations involving costly machines and highly skilled labor can no longer be supported economically by sprawling, inefficient storage methods.

Ask Frick-Gallagher how F-G-M Storage Planning can save manpower inside and outside of storage areas, provide greater accessibility in less floor space, and reduce your factory cost. F-G-M experience and know-how are available to you for the asking.

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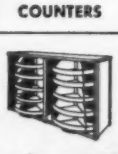
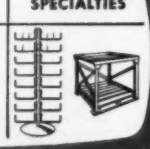
STEEL EQUIPMENT FOR EVERY STORAGE NEED

ROTABINS	STEEL SHELVING	WAREHOUSE RACKS	COUNTERS	SPECIALTIES





CIRCLE INFORM-A-GRAM KEY NO. 138

"Commendable Comments"

". . . it will be the creative man who will make the greatest contribution toward reaching our future objectives . . . . Since there is no substitute for genius, more emphasis on incentives to encourage those who have the ability for advanced thinking and proper recognition of their creative efforts are needed."

—Dr. John T. Rettaliata, president Illinois Institute of Technology, addressing Skokie Valley Industrial Association.

"I believe that from now on we can look for a steady increase in the number of large-scale installations of computers and new instrumentation systems in business and industry as a result of the increasing emphasis on systems engineering. The previous shortage of top technical manpower will be diminished by the present defense cut back, and systems engineers previously occupied with military problems will be able to devote an increasing fraction of their energies to the civilian industry."

—Dr. Simon Ramo executive vice-president, The Ramo-Wooldridge Corporation, at the 12th Annual Instrument-Automation Conference in Cleveland.

"What an astonishing paradox we present: We set high standards of achievement, yet, when the rewards of achievement are won, we reclaim most of them in the guise of taxation so that achievement becomes not only financially unattractive, but an actual burden. We admire success, but penalize the successful; we admire talent, but penalize the talented; we admire initiative, yet penalize the initiator; we admire philanthropy, yet penalize the philanthropist; we admire leadership, yet we penalize and harass our leaders."

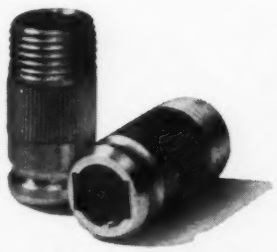
—Crawford H. Greenewalt, president Dupont Company, Addressing Economic Club of New York.

"There are three things that all men seek from the institutions to which they devote their working lives. The first is identity. The individual must be able to identify himself with the institution, and its purposes, to feel a part of it . . . . The second is opportunity . . . keeping a person in a job that does not demand his best is like keeping a child in shoes that are two sizes too small for him . . . . The third is equity, meaning justice seasoned by mercy, and a sense of humor."

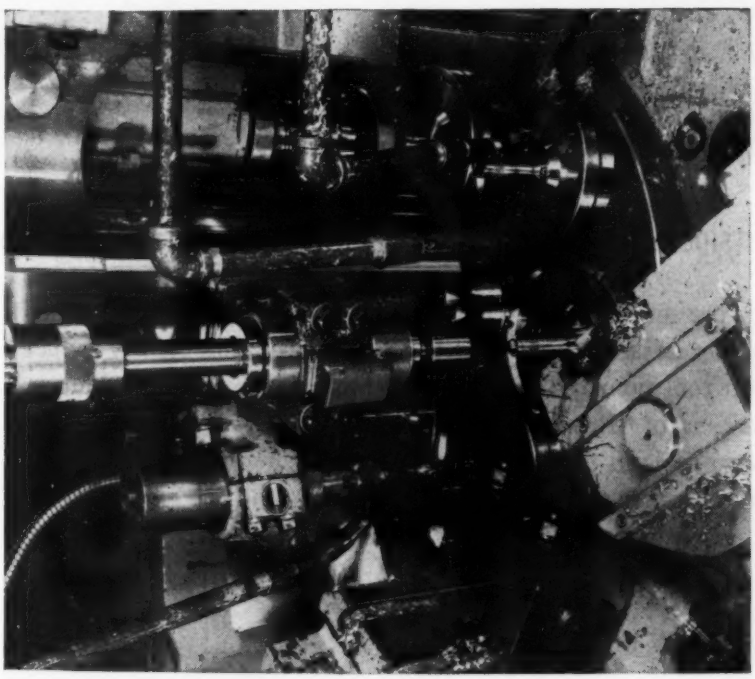
—Colonel Lyndall F. Urwick, chairman, Urwick, Orr, and Partners, Ltd., at American Management Association General Management Conference.

At Porter-Cable Machine Company.....

6-Spindle Automatic saves $12,700 on this one job!



A savings of over 7½¢ was realized on each of these small brass Brush Holder Bodies for electric motors when this formerly subcontracted work was handled on one of their 1¼" Warner & Swaseys.



Porter-Cable of Syracuse, N. Y., veteran producer of wood-working tools and powered garden equipment, reports through their Chief Manufacturing Engineer, Charles Allen: *"Our two Warner & Swasey 6-Spindle quick setup Automatics have an important place in our cost-reduction program. They consistently turn out the highly accurate parts our products require, saving us money on jobs that run in lot sizes from a few hundred to many thousand pieces."*

Here's what Warner & Swasey 6-Spindle Automatics did for Porter-Cable Company:

- **ACCURACY**—Tolerances of plus or minus .001" easily held, maintaining high product quality.
- **SAVINGS**—Second operations were eliminated—handled complex work formerly subcontracted.
- **FAST SETUP—SMALL LOTS**—Jobs previously run on hand screw machines now more efficiently handled on the Automatics.
- **VERSATILITY**—Machining of tougher materials, parts with threads at each end, multiple diameters, broached holes are all now routine operations.

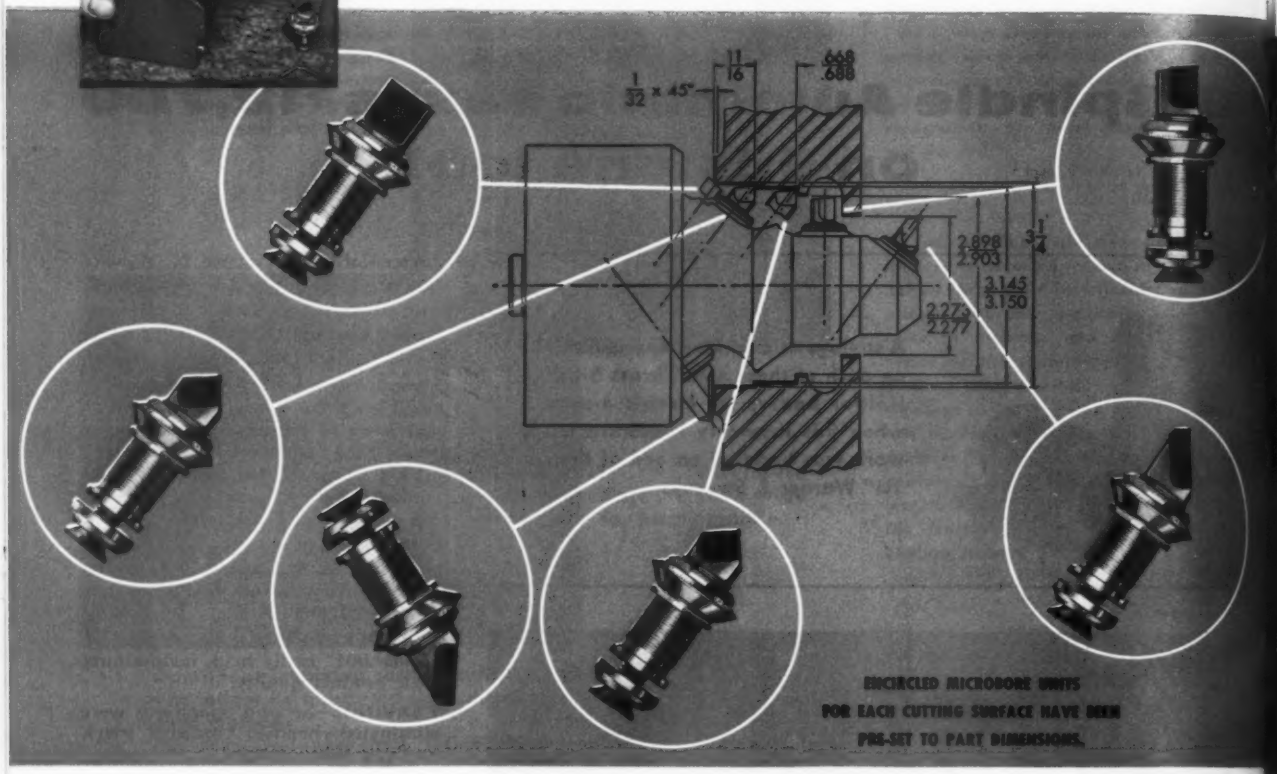
Why not have our Field Engineers evaluate your operations with a view to highlighting jobs that could be more profitably machined on modern Warner & Swasey Multi-Spindle Automatics? He's as near as your phone—call him today!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

CIRCLE INFORM-A-GRAM KEY NO. 139

new microbore "PRE-SET" TOOLS...

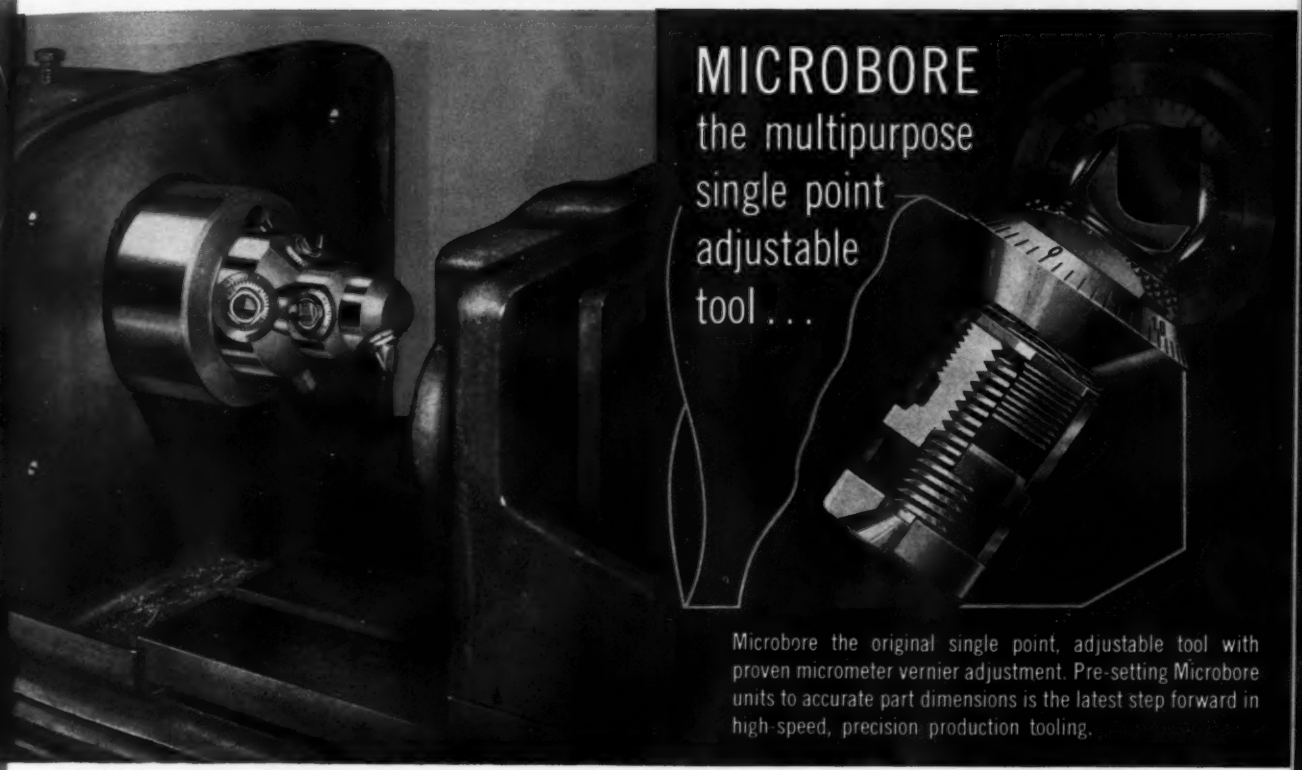


NO TRIAL CUTS! PRE-SET OUTSIDE THE MACHINE TO PART DIMENSIONS! CHANGED IN SECONDS!

Microbore tools can now be pre-set to accurate part dimensions and quickly positioned in the machine without further adjustment. "Pre-Set" Microbore units greatly reduce machine downtime for worn tool point adjustment and eliminate scrap parts due to trial and error set-up. Changing of "Pre-Set" units is so fast and easy that operators are encouraged to keep sharp tools in their machines, guaranteeing greater accuracies and avoiding breakage due to dull tools.

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

drastically reduce downtime



Microbore the original single point, adjustable tool with proven micrometer vernier adjustment. Pre-setting Microbore units to accurate part dimensions is the latest step forward in high-speed, precision production tooling.

"Pre-Set" Microbore units may be applied to standard boring, turning and facing operations. They are especially suited for production and automated operations where machines must maintain closest tolerances on long runs.

USE "PRE-SET" ON

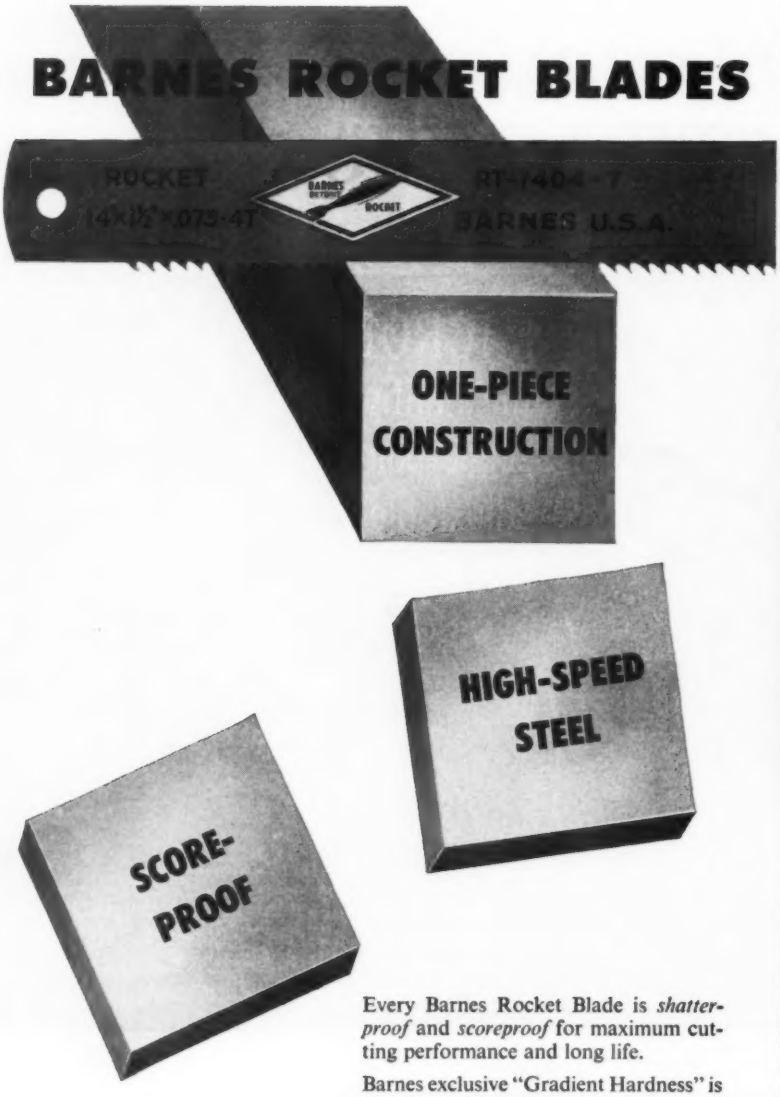
Automated Boring Machines
Precision Boring Machines
Turret Lathes
Horizontal Boring Machines
Vertical Boring Machines

• Write today for complete information on this new process!

DeVlieg Microbore System

2720 WEST FOURTEEN MILE RD., ROYAL OAK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 141



Every Barnes Rocket Blade is *shatterproof* and *scoreproof* for maximum cutting performance and long life.

Barnes exclusive "Gradient Hardness" is the reason. Blade hardness is graduated from tough, hard teeth for best cutting ability to a strong, semi-hard back for flexibility and resistance to scoring.

Rocket blades are preferred by safety engineers. The flexibility of the tough, semi-hard back absorbs heavy shock loads and eliminates shattering.

Barnes Rocket Blades require only low cost, water soluble coolants—yet *do not score*. Scoring wastes power and shortens blade life. Special oil coolants retard scoring but add cost and create safety hazards.

Call your Barnes Distributor today!

He has a complete stock of Rocket blades for all your power or hand hack saw requirements!

W. O. **BARNES** CO., INC.

1297 TERMINAL AVENUE • DETROIT 14, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 142

756 Rocker Arms Drilled per Hour on Two Special Machines

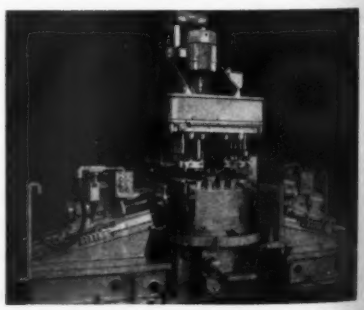
Two new multiple-spindle drillers complete 756 valve rocker arms per hour at 100% efficiency. This combination consists of a vertical Holesteel machine and a three-way Natco manufactured by the National Automatic Tool Company, Inc.

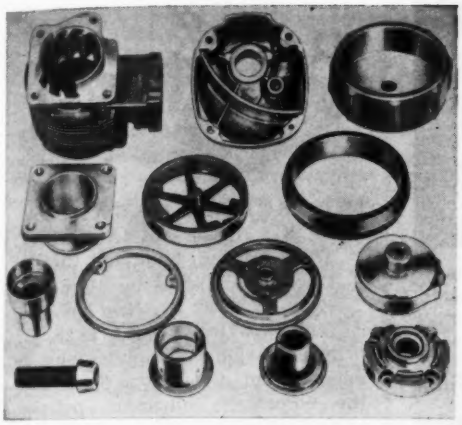
Figure 1

The vertical Holesteel machine, Figure 1, has 16 spindles and a six-position automatic indexing fixture. Four parts are clamped hydraulically at each position as the major hole in each part is core drilled, rough reamed, and semi-finish reamed. Parts are automatically ejected.

The three-way Natco, Figure 2, consists of a vertical head with 12 spindles and two angular heads with four spindles each. The four-position automatic indexing table holds four parts at each position. Two holes are drilled through in two steps and one is finish-bottomed. Parts are hydraulically clamped. A hydraulic distributor insures constant clamping pressure at working stations even when parts are loaded or unloaded.

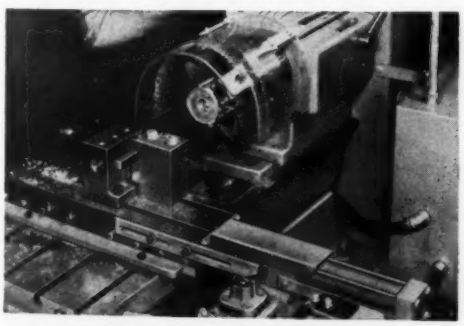
Figure 2





If your operations call for turning, boring, facing, forming, grooving, chamfering, beveling, or cut-off of parts such as these (pieces shown merely suggest the almost endless variety), there's a CLAUSING Hydra-Cycle for handling these operations in combination or singly, with great speed, to close tolerances, and at low cost.

All the operator has to do is load the machine, press a button, take out the machined piece seconds later. The Hydra-Cycle does the rest, automatically.



Six surfaces are being machined in the operation shown above. As is the case with most jobs that can be handled by the Hydra-Cycle, the tooling required is simple, inexpensive.

500%

PRODUCTION INCREASE— PROPORTIONATE COST REDUCTION IN SMALL PARTS MACHINING!

MODEL 6405
4 Operating CYCLES

THE NEW CLAUSING SEMI-AUTOMATIC BORING AND TURNING MACHINE

4 MODELS—ONE TO MEET YOUR EXACT NEEDS

Users report production increases of 200% to 500%, with corresponding cost reduction, and jobs have been held to .0002 tolerance on production runs. Average job change and set-up takes from 15 to 30 minutes. No special jigs or fixtures required . . . simple block tool holders, carbide insert bits and standard boring bars will handle most jobs. Operator merely loads, presses starter button, and unloads finished pieces *seconds later* . . . machining operations are performed automatically . . . simultaneously or in continuous sequence. A time and money saver on short as well as long production runs.

SPECIFICATIONS: 5″ x 16″ cross slide with 4-11/16″ swing, 5″ travel; 12″ x 14″ table with 9″ swing, 8″ travel. Prices start at $4250 with electricals and hydraulic equipment installed.

NO OBLIGATION OFFER!

Simply send us complete data . . . drawings of rough and finished part, indicating material, tolerances, finish required, production rate — and, samples of finished and unfinished parts. Our engineering department will gladly make recommendations for the use of the Hydra-Cycle model best suited to your requirements. No obligation. Mail to Hydra-Cycle Department, Clausing Division, Atlas Press Company, Kalamazoo, Michigan.

CLAUSING

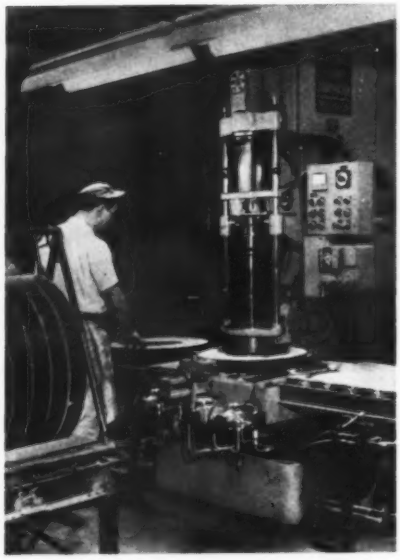
CLAUSING DIVISION
ATLAS PRESS COMPANY
11-115 N. Pitcher St. — Kalamazoo, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 143

Why MICROHONING

Lowers Costs, Increases Production, Improves Quality of Grinding Wheels

Bay State Abrasive Products Company, one of the largest and most progressive manufacturers of abrasive products, Microhones the arbor hole of their snagging wheels to secure improved wheel performance, reduce manual handling, lower processing costs and increase production.



Why Microhoning Saves Time, Energy and Reduces Processing Costs of Arbor Holes over 50%:

1. **Less Equipment**—one Microhoning machine does work of two grinders.
2. **Less Operating Costs**—Microhoning processes 450 to 600 grinding wheels per set of abrasive sticks; abrasives cost was substantially higher with former grinding method.
3. **Less Maintenance**—Hydrohoner has no chucks to maintain and there is now only one machine instead of two.
4. **Less Gaging**—Microhoning *automatically* brings arbor hole to size within .003" tolerance; former grinding method required repeated gaging during operation.

Why Microhoning Improves Performance of Grinding Wheels:

1. **Better Fit**—inherent qualities of the Microhoning process are geometric accuracy and ability to hold close tolerances . . . rounder and accurately sized arbor holes assure a better fit.
2. **Less Arbor Wear**—Microhoning cuts both abrasive grain and resinoid bond while producing a smoother hole.
3. **Less Chatter**—Microhoning assures arbor holes that are square with faces and more concentric with O.D.

See page to right for "How Microhoning" accomplishes the above results.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 144

INDUSTRIAL ORGANIZATION AND MANAGEMENT, Third Edition, by Ralph Currier Davis. Published by Harper & Bros., 49 E. 33 St., New York 16, N. Y., 1957. 940 pages, $8.25.

In developing his philosophy of management, the author deals with the objectives, functions, policies, and relationships of the principle line and staff departments that make up the production division of a manufacturing firm. As an addition to the topics in previous editions, he also covers the work of marketing management and financial management, in an effort to give the reader an understanding of coordinating production distribution and finance. The basis of long-range planning and inter-plant coordination is discussed in a chapter on administrative management to show the relations between operative management and administrative management in an industrial organization.

PRACTICAL AUTOMATION, by Lester R. Bittel, Moreley G. Melden, and Robert S. Rice. Published by McGraw-Hill Book Co., 330 W. 42 St., New York 36, N. Y., 1957. 376 pages, $7.50.

Engineers and managers can find numerous examples of how to use automation in manufacturing plants to increase productivity, cut operating costs, and improve safety and working conditions, in this large volume.

It explains and illustrates the fundamental methods and thinking essential to planning and setting up for effective automation. The examples of successful installations in plants of all sizes in various industries are from *Factory Management & Maintenance* magazine articles. These are well arranged and tied in with introductory material on the specific topic covered in each section.

How to solve problems likely to be met in installing automation, combining machines and equipment already in the shop, where to look for possibilities of applying feedback control, purchasing new tools for automation, "rethinking" the entire manufacturing operation, and solution of new maintenance problems are some of the important aspects of automation explored in the book.

ABACS OR NOMOGRAMS, by A. Giet. Translated from the French by Head and Phippen. Published by Philosophical Library, Inc., 5 E. 40 St., New York 17, N. Y. 325 pages, 152 illustrations, $12.

Nomograms, convenient tools for use when the same formulas have to be solved repeatedly for several sets of variables, are often used by engineers. Few engineers, however, construct them because they don't know how to do it. This book is for the "practical engineer." It shows the many and varied applications of the abac or nomogram and how even persons without highly specialized mathematical knowledge can construct their own charts. It deals with both Cartesian abacs and alignment charts, and contains many examples drawn from mechanical, physical, and electrical engineering.

BORON, CALCIUM, COLUMBIUM, AND ZIRCONIUM IN IRON AND STEEL, by Grange, Shortsleeve, Hilty, Binder, Motock, and Offenhauer. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York, 1957. 533 pages, $14.

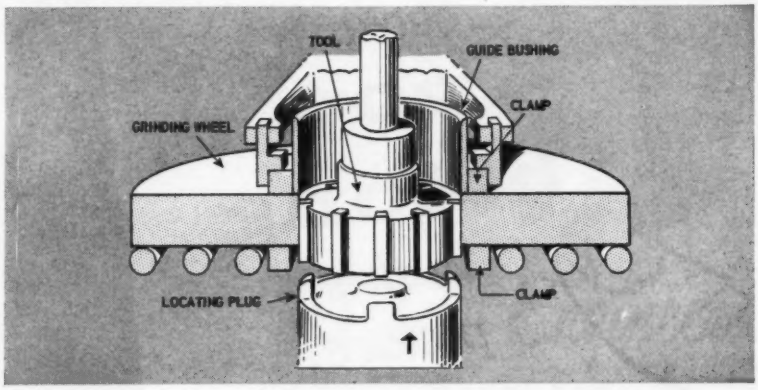
This is the fourth volume in the Alloys of Iron New Monograph Series. In it, six authorities combine efforts to present in four individual monographs, a concise critical summary of the world's literature in the field. Among the many points included for each element are its methods of extraction and preparation, engineering properties, its effect on metals, and its application. Extensive bibliographies follow each section, and a general subject index is augmented by an individual name index for each element.

THE SCREW MACHINE PRODUCTS USERS' BUYING DIRECTORY. Published by the National Screw Machine Products Association, 2860 E. 130 St., Cleveland 20, Ohio, 1957. 80 pages.

This twenty-fifth anniversary edition, like previous editions, covers the location and facilities of NSMPA member companies. More than 275 companies are listed both alphabetically and geographically for easier reference. The facilities listing includes primary equipment, including the type and size range of machines available for contact work; types of material machined; secondary operations available; information covering the particular field of product in which the company has restricted or concentrated its manufacturing operations; and any end products also manufactured by the company.

How MICROHONING Lowers Costs, Increases Production, Improves Quality of Grinding Wheels

By changing from grinding to Microhoning of arbor holes, Bay State Abrasive Products Company has realized substantially lower processing costs, raised productivity and improved the performance qualities of their snagging wheels.



Here's How Microhoning Now Saves Time, Labor, Material and Processing Costs:

1. Snagging wheels now travel from facing machine to Hydrohoner on a conveyor—there is no manual lifting or handling.
2. A disappearing plug automatically locates wheels in Hydrohoner where they are clamped on the faces and remain stationary during Microhoning operation—there is no manual placing of wheels on chucks, or chucks to maintain.
3. One Hydrohoner does work of two grinders; and one set of Bay State iron bonded, diamond sticks Microhones from 450 to 600 resinoid-bonded wheels—less equipment to maintain and lower costs for abrasive.
4. In approximately a minute, Microhoning removes from .030" to .070" of stock from arbor holes ranging in diameter from 6" to 12"—processing is faster and material is saved because wheels can now be molded closer to final size.
5. Microhoning tool automatically holds diametric accuracy within .003" tolerance—repeated manual gaging is eliminated.

See page to left for "Why Microhoning" provides cost-and-time-saving benefits.

Send Coupon for Complete Information

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____H

TITLE_____

COMPANY_____

STREET_____

CITY_____ZONE_____STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 145

Everybody profits ...because

you belong

in this picture!

The publisher of this magazine is often asked what kind of a man you are . . . and how many like you are receiving his magazine.

Why is he asked?

Because the *advertisers* (whose money is his chief income) insist upon knowing the types of people (by industry or profession, by title) for whom the magazine is edited — and how many are getting it.

In order to standardize on the presentation of such information to advertisers and to have its accuracy vouched for by a disinterested third party, nearly 450 publishers have joined some 200 leading advertisers and advertising agencies in a non-profit organization called Business Publications Audit.

The purpose of BPA is to assure advertisers . . . by frequently checking and rechecking . . . that each member publisher is indeed distributing his magazine, in the *numbers* promised, to the *types* of men he promised would receive it.

The BPA symbol in this magazine means that *you belong* . . . that because of your occupational interests you are qualified, in the eyes of the advertisers, to receive it.

The advertiser can thus tell whether he's getting his money's worth.

The publisher has a better sales story to prospective advertisers because his magazine is "audited."

And you, the reader, get more value from the magazine because both the advertisers and editors, knowing what your special occupation is and what your interests are, are better able to prepare advertising and editorial material that will be most informative and useful to you.

What you can do

Publishers and advertisers frequently write to magazine readers to learn what kind of articles and advertisements appeal most. Cooperate with them — will you? — by answering their questions . . . in the interest of better communications between makers and markets.

BUSINESS PUBLICATIONS AUDIT OF CIRCULATION, INC.

420 Lexington Avenue New York 17, N. Y.

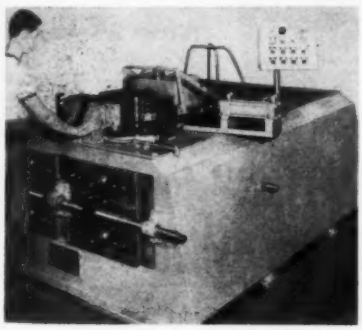
BPA

A NON-PROFIT, TRIPARTITE MEMBERSHIP CORPORATION OF ADVERTISERS, ADVERTISING AGENCIES AND BUSINESS PUBLICATIONS

PRESS AND BENDER COMBINATION FORMS TWO TUBULAR PARTS

A versatile, fully-automated, horizontal punch press and multiple bending combination machine has been announced. It is ideally adapted to the production of tubular furniture, automotive and aircraft molding and trim, and will also handle angle, square or rectangular-sectioned shapes.

This new hydraulic-powered, high-speed machine, manufactured by Walter P. Hill, Inc., utilizes unique press bending principles to simultaneously pierce and countersink holes, flatten, coin weld projections, and produce multiple bends in two tubular parts at a time at a net production rate of 1440 pcs/hr. In the machine illustrated, the operator loads one potential right-hand and one potential left-hand straight tubular part into the dies and presses twin safety cycle start buttons to actuate the hydraulic-powered ram.



The wing dies on the machine can be reversed in both position and action to form "S" shaped sections. The bed construction permits the addition of hydraulic cylinders for forming, piercing, flattening and cut-off operations after the bending is done.

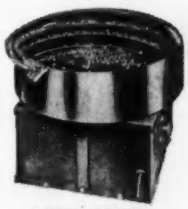
The machine is extremely versatile and can be operated as either a fully automated or manually-controlled type for varying production requirements. The pushbutton panel includes controls for single-cycle and automatic-cycle, as well as controls for "inching" each machine function. All controls are interlocked to prevent machine or die damage during setup operation.

If desired, the machine can be used as a horizontal punch press. The wing dies are interchangeable, and the right and left-hand leadscrews at the side and front permit adjustment for a variety of bending radii.

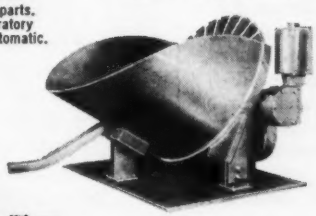
Industrial GIANT or One-Man Shop

DPS Engineers CAN SOLVE YOUR ASSEMBLY PROBLEM!

● For assembling operations large or small, intricate or simple, we are prepared to take care of your requirements. If you have a feeding or assembling problem, though seemingly difficult, don't hesitate. Write today, send sample assembly, give details.

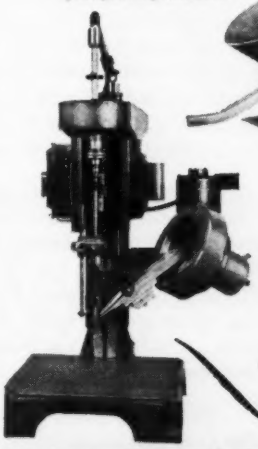


BOWL FEEDER
for light, fragile parts. Operates on vibratory principle. Fully automatic.



DPS
All-Purpose SELECTIVE PARTS FEEDERS

BARREL FEEDER
with stationary ring cover for heavy-duty production.



DPS
POWER SCREWDRIVERS
5 MACHINES
BENCH & PEDESTAL TYPES

BARREL FEEDER
conventional, motorized type, for parts requiring critical selection.

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PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

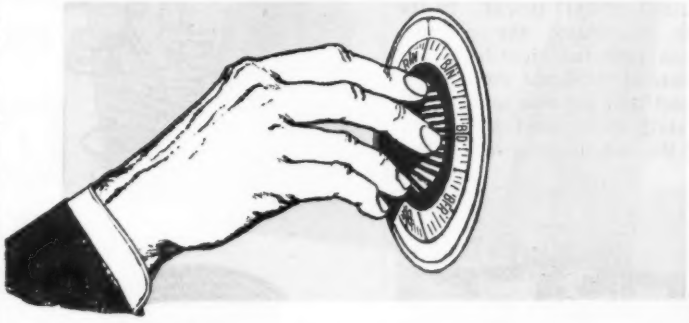
A Technical Digest of stainless steels offers the description, chemical composition, strength factors, physical properties, and typical applications for a broad range of stainless types. The catalog also includes forging ingots and rolled-in surface pattern stainless steel. This catalog is available by writing Sharon Steel Corp., Sharon, Pa., or—
Circle Inform-A-Gram No. B1.

Characteristic of the design of Sturdimatic live centers is a low overhang and a slight cushioning action that compensates for expansion due to heat, shock, and excessive thrust loads. Other features of these centers are highlighted in an illustrated bulletin. Adapter center dimensions and tubing center specifications are accompanied by detailed diagrams of these products. For more information write to the Sturdimatic Tool Co., F St., Detroit, for a copy of Bulletin 757, or —
Circle Inform-A-Gram No. B2.

A Line of straighteners for flattening ferrous and non-ferrous coiled strip or sheet is featured in a catalog. The machines covered are divided into four types: roll feed straighteners, with direct pinion drive, spindle driven roll straighteners, back tension units used in rolling engineered straightening units. Special straighteners engineered for specific applications are shown. Copies of Bulletin 820-T-5 are being distributed by The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn., or —
Circle Inform-A-Gram No. B3.

Carbide Stub Screw Machine Reamers are listed according to size, number of flutes, overall length, diameter of shank, and size range in inches in a bulletin. They are designed for use without bushings and ground to customer specifications. Illustrated Bulletin EB-141 is made available by Super Tool Co., 21650 Hoover Rd., Detroit 13, or—
Circle Inform-A-Gram No. B4.

Information concerning a hydrabrasive precision surface grinder line is fully illustrated and described in a catalog. Features, capacities, weights, and specifications of the Nos. 824, 1218, and 1224 are given in the 6-page catalog. Copies of the catalog are now being made available by Abrasive Machine Tool Co., E. Providence, R. I., or—
Circle Inform-A-Gram No. B5.



The "RIGHT COMBINATION" for every reinforced grinding wheel

. . . because Norton builds the "Touch of Gold" into it

For every grinding, cutting-off or slotting job where you need a reinforced wheel, there's one Norton wheel that will do it best.

Norton helps you make more money by supplying a complete line of reinforced wheels. You get the size, the abrasive, the reinforcing web and the rubber or resinoid bond best suited to the work. Such a wheel puts the "Touch of Gold" in your hands for better production at lower costs.

. . . because Norton builds in Strength and Safety

These pages can't begin to show the many combinations to be found in Norton Reinforced Wheels, mounted wheels and points and sticks.

Norton makes so many varieties you can enjoy the just-right combination you're after. This "combination" lets you work fastest . . . safest . . . and most profitably. It's your advantage in dealing with the world's largest supplier of abrasives.

Also, Reinforced Mounted Wheels and Sticks

See your Norton distributor for further facts about reinforced abrasive products. Ask him for Booklet No. 1748. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Ball Bearing master steel rule die sets are the subject of a bulletin which includes very detailed diagrams of these sets, and each part of each diagram is named for easy reading. The basic dimensions are presented in chart form as is the bill of materials for all types of die sets. For further information write to Lempco Industrial, Inc., 5490 Dunham Rd., Bedford, O., or—
Circle Inform-A-Gram No. B6.

Base Power Units, blank cast bowls, and fabricated supply and storage hoppers are reviewed in a catalog. Pictures and diagrams accompany descriptions, lists of advantages, and outstanding features. There are also charts of specifications. Special bowl patterns can also be obtained upon request. Contact Vibratory Feeder Co., Erie, Pa., for copies of Catalog 5742, or—
Circle Inform-A-Gram No. B7.

NEW
RN WHEELS
Glass Cloth
New — for the foundry and lower priced! Norton has been field-testing a new rubber-bonded-reinforced wheel. It's ready now and well worth your investigation for savings in your cutting-off operations on ferrous and non-ferrous metals.
NOW — as thin as 1/16"
BN WHEELS
Glass Cloth
Ten inch diameter wheels can now be had 1/16" and 3/32" thick. In this range specify A36T8N. For heavy duty work, requiring larger, thicker wheels, specify A24R14BN. Use them for slotting, for cutting-off non-ferrous metals, wire rope, many non metallic materials.
BD WHEELS
Glass-Nylon
For fastest cutting on right-angle grinders you'll want the glass cloth reinforced resinoid bonded hub wheels of rigid type. Use for medium to heavy weld grinding and smoothing flame-cut edges. Specify A24NBD for fast cut, A24QBD for long life. For cutting-off, A24RBD which is Nylon reinforced.
BFR WHEELS
Cotton-Nylon
Top performers for light, portable grinding. These semi-flexible resinoid wheels have cotton fabric with an additional layer of Nylon for added safety. Specify A24KBFR for weld smoothing, removing scale, light finishing/ minor cut-off jobs, etc.
BF WHEELS
Cotton
These resinoid straight wheels with cotton fabric reinforcement are "the right combination" for peripheral grinding, do a fine job of deburring and finishing. Fine for blending and smoothing light welds. Also available in mounted wheels and sticks.
W-1810
NORTON
ABRASIVES
Making better products... to make your products better
NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines
Refractories
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Behr-cut Tapes
CIRCLE INFORM-A-GRAM KEY NO. 149

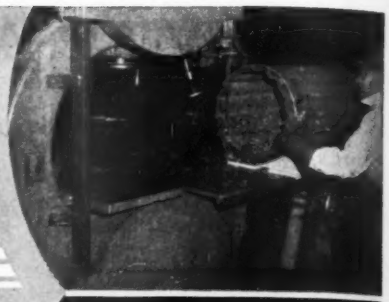
Horizontal, vertical, and cross feed are controlled simultaneously on the Sundstrand vertical tracer Rigidmil outlined in a bulletin. Photos and illustrations show the machine in action, and advantages are described. Drawings are also given of the typical cuts which can be made with the vertical tracer Rigidmil. A complete list of specifications and dimensions are included. Copies of "Sundstrand Vertical Tracer Rigidmil" are issued by the Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill., or—
Circle Inform-A-Gram No. B8.

A 4-Page illustrated bulletin covers heavy-duty metal-sheet handling equipment for automatically feeding and delivery piling both ferrous and non-ferrous sheets. Sizes up to 120" x 180" and loads up to 15 tons can be handled. Specifications are given for the hydraulic feeders and technical information including operating speeds, thicknesses of sheet or plate handled, load capacities, and brief explanations of how the machines operate are also given. The bulletin may be obtained from the Dexter Folder Co., 219 E. 44th St., New York, or—
Circle Inform-A-Gram No. B9.

A 24-Page Bulletin illustrates and describes a complete line of Elmes hydraulic metalworking presses for drawing and forming, straightening, forcing, bending, reducing, hobbing, etc. Electric control provides semi-automatic operation, automatic operation, and inching. Both standard designed and special custom-built presses are illustrated and outlined. Bulletin 1010-C is being distributed by American Steel Foundries, Elmes Engineering Div'n, 1150 Tennessee Ave., Cincinnati 29, or —
Circle Inform-A-Gram No. B10.

A 56-Page Catalog on carbide tips, tools, and inserts has been released by Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30. A picture index easily identifies each product, and the pages have been die cut to expose the beginning of each section. A complete grade selection chart is included. Direct requests for copies of Catalog TTI-57 to the company, or—**Circle Inform-A-Gram No. B11.**

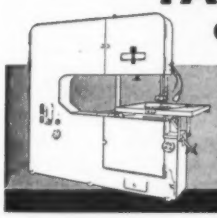
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS



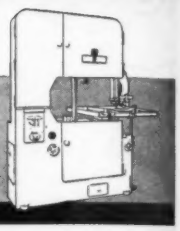
FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1501

MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
7/8	1-9/16	$12.75
1	1-13/16	12.75
1 1/4	2-1/16	13.25
1 1/2	2-7/16	13.25
1 3/4	2-3/4	16.75
2	3-1/16	19.50

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1502

Drill Hardened Steels without Annealing—

USE The New IMPROVED "HARDSTEEL" DRILL

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

"HARDSTEEL"

CIRCLE INFORM-A-GRAM KEY NO. 1503

The Light-Heavyweight Machine Tools Line and accessories made by Walker-Turner Div'n, Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, are described in detail in a catalog. The line includes band saws, circular saws, cut-off machines, drill

presses, radial drills, grinders, lathes, etc. Capacities, speeds, and dimensions of each model are listed separately from general descriptions to facilitate easy selection. Obtain copies of the catalog from the company, or —
Circle Inform-A-Gram No. B12.

A 24-Page bulletin, "Machine Tool Control," has been issued by True-Trace Sales Corp., 9830 E. Rush St., El Monte 85, Calif. The bulletin is illustrated with photographs of continuous and intermittent positioning systems, hydraulic tracers, numerical controls, and programming controls. It also covers accessory units such as hydraulic cylinders, power units, and hydraulic milling spindles. For copies of this booklet write to the company, or—
Circle Inform-A-Gram No. B13.

Over 110 Different Products for safety, maintenance, and production are described and illustrated with photos and detailed drawings in a catalog. Complete information for selecting and ordering metalworking tools, motor and generator maintenance equipment, flexible shaft machines, safety equipment, and electrical and mechanical maintenance products is given. Included are sections on rotary burs, files, metal cutting saws, mica undercutters, field coil testers, etc. Direct requests for copies of Catalog 31 to Martindale Electric Co., Box 617 Hird Ave., Cleveland 7, or—
Circle Inform-A-Gram No. B14.

A Combination Bulletin-Specification Sheet illustrates and describes a complete line of surface grinding wheels. A wide range of standard types and sizes are included in a handy specification table. Custom wheels are also developed for special applications. Practical grinding suggestions are also included. Copies of this bulletin may be obtained from Simonds Worden White Co., 1101 Negley Pl., Dayton 7, O., or —
Circle Inform-A-Gram No. B15.

Automatic Operation for Jones & Lamson Machine Co. standard turret lathes is described in a 4-page illustrated folder. Ram and cross-slide travel ranges for J&L ram type turret lathes equipped with Lynn hydraulic drives, are also included. Specifications are listed for each model and advantages outlined. For your copy of this folder write to Jones & Lamson Machine Co., Springfield, Vt., or —
Circle Inform-A-Gram No. B16.

After the heaviest cuts— they disengage with a twist of the wrist

Continental Counterbores are designed so that cutting torque produces compression rather than shearing stresses. This counterbore never binds—you get quick, easy disengagement after all cutting operations. Anti-wedging action saves time and tools.

For more information or literature on Continental Counterbores, call your local Ex-Cell-O Representative or write to Continental Tool Works in Detroit.

57-17

Continental TOOL WORKS
DIVISION OF
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 151

HOLD IT!

FIRMLY BUT GENTLY

WITH WOODWORTH CHUCKING EQUIPMENT

Our tough looking character who is holding the little bird clearly demonstrates one fact: whenever you are holding *anything* it should be secured with gentle firmness. And this is so true when considering chucking equipment.

Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

We invite your inspection and consideration of N. A. Woodworth products. There is a Woodworth Sales Representative in your area and a letter to the N. A. Woodworth Company will place him promptly at your service.

"Accuracy you can trust"

WOODWORTH
1300 East Nine Mile Road
Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1521

FOR THE "HOLE" FIELD

NEW CONCEPT IN AUTOMATIC DRILLING AND TAPPING UNITS

MODEL 500 DULL TOOL LITE AND SUB-BASE

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Drillmation's hydraulic, locked-circuit feed Drilling and Tapping Units are the finest and most completely self-contained of any similar unit available today. Drillmation also offers more essential and exclusive features. Write TODAY for literature.

12 ESSENTIAL Exclusive FEATURES in 1 Unit

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- **RAPID TOOL CHANGE** Tool may be replaced without changing the controls.
- **UNIFORM TIME CYCLE** Maintains comparatively constant time cycle even when tools become dull.
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- **COMPLETELY AUTOMATIC** Enclosed electric controls. Unit is "Fail Safe".
- **THRUST CONTROL** Maximum thrust may be set to protect tools. Will not surge at break point.
- **FEED CONTROL** Infinitely variable and positive feed rate.
- **RAPID APPROACH AND RETURN** Variable irrespective of RPM.
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- **EMERGENCY QUILL RETURN** Button on front of unit. Aid in setting tools.
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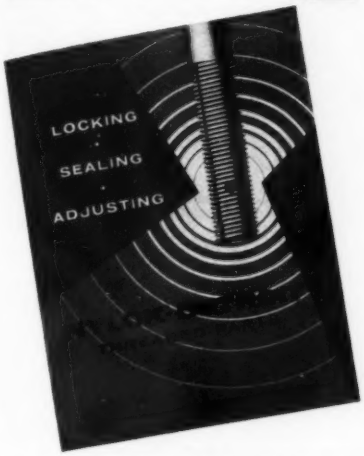
CIRCLE INFORM-A-GRAM KEY NO. 1524

The Patented Self Locking, sealing, and adjusting principle of Nyloc-Detroit threaded parts are described and illustrated in a manual. The literature also explains how the protruding nylon pellet permanently in-



serted in the threaded section can now be applied to any threaded part regardless of size, shape, or function. Also included are basic engineering recommendations. Write to Nyloc-Detroit Corp., 1100 N. Woodward Ave., Birmingham, Mich., or—
Circle Inform-A-Gram No. B17.

"Calibore, a New Concept in Precision Cutting Tool Units" is a new catalog which gives specifications and dimensions of the Calibore. Also given is information on setting and adjusting the units which can be used in applications wherever precision boring, turning, or other cutting operations are being performed. Detailed diagrams of the tools are presented with each list of sizes. The Calibore units are easily adapted to multiple or cluster bar installations and come in 26 sizes. Catalog 57 can be obtained from Beaver Tool and Engineering Corp., 500 W. County Rd., Gaylord, Mich., or —
Circle Inform-A-Gram No. B18.

"Haynes Hard-facing Alloys in Coils," a revised issue, describes the chemical composition, some properties, typical applications, and application procedures for the six Haynes iron-base alloys produced in drawn tube rod form and for Haystellite cast tungsten carbide rod, which is an ordinary tube rod that is not drawn. Both types of rods are available in coils. This issue is published by Haynes Stellite Co., Div'n of Union Carbide Corp., 420 Lexington Ave., New York 17, or—
Circle Inform-A-Gram No. B19.

The No. 2 Wheelabrator Multi-Table is described in a catalog published by the Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind. This machine can be used either for cleaning or peening operations. The catalog explains the difference in specifications for the two operations. Mechanical, electrical, and general specifications are clearly presented. Write to the company for copies of Catalog 140-D, or—
Circle Inform-A-Gram No. B20.

Hydraulic Power Packs for simultaneous operation of up to 4 fastener installation tools are featured in a catalog. Descriptions of both the Model 800 power pack for use with two pull tools and the Model 810 power pack for use with up to 4 pull tools are included in the catalog. Features and specifications are also presented. Direct requests for copies of Catalog 8-425 to Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, or—**Circle Inform-A-Gram No. B21.**

FINE CUTTING TOOLS
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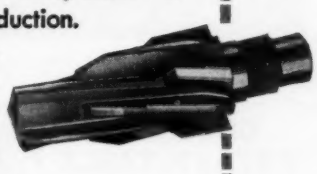
Since 1913 Eclipse has been consistently and conscientiously serving many companies in widely diversified fields of production. Each of these companies has found that "Engineered by Eclipse" is assurance of genuine quality in end cutting tools.



- High Speed Steel Cutters
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- Core Drills
- Inserted Blade Cutters
- Multi-Diameters
- Back Spotfacers

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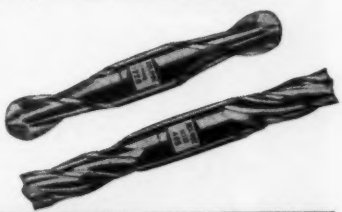
Eclipse now has a complete line of Precision End Mills. Ground from the solid, Eclipse End Mills insure longer tool life, finer finishes and lower production costs.



- Write for Counterbore Cat. No. 51
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END MILL DIVISION—NORTH BRANCH, N. J. ADDRESS (BOX 97, RARITAN N. J.)

FOR CATALOG NO. 51 CIRCLE INFORM-A-GRAM KEY NO. 1531

FOR CATALOG NO. 56 CIRCLE INFORM-A-GRAM KEY NO. 1532

Illustrations and descriptions of engineered gravity roller conveying systems are contained in a brochure. In addition, to installations showing various types and combinations of this equipment, the brochure presents blueprints, and descriptions of straight roller sections, curves, switches, ball tables, hinged sections for passageways, etc. Contact The Alvey-Ferguson Co., 2091 Disney St., Cincinnati 9, for copies of the bulletin, or—
Circle Inform-A-Gram No. B22.

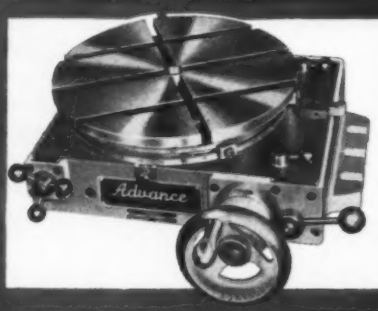
Chromium Plated Gage Blocks are the subject of a bulletin which presents specifications and lists the types and sizes available. Sets of gage blocks are described and illustrated and accessories are listed. Sets are available with either rectangular or square gage blocks. The gage block inspection service is also explained. Write to The Dearborn Gage Co., 22038 Beech St., Dearborn, Mich., for copies of the Ellstrom gage blocks catalog, or—
Circle Inform-A-Gram No. B23.

CUT TOOL and DIE MAKING COST...
By Reducing Set-up Time as Much as 90%

ADVANCE
CROSS SLIDE
ROTARY TABLE

Permits fast, precise positioning of workpiece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table.

30 Seconds Accuracy
(Comparable Tables Cost Twice As Much!)



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ROTARY TABLE

This rugged, precise tool is designed for all types of work requiring rotational accuracy. Its maximum speed and precision, and minimum maintenance fills the need for a precision unit at a moderate price.

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N. Shore Dr., Benton Harbor, Michigan

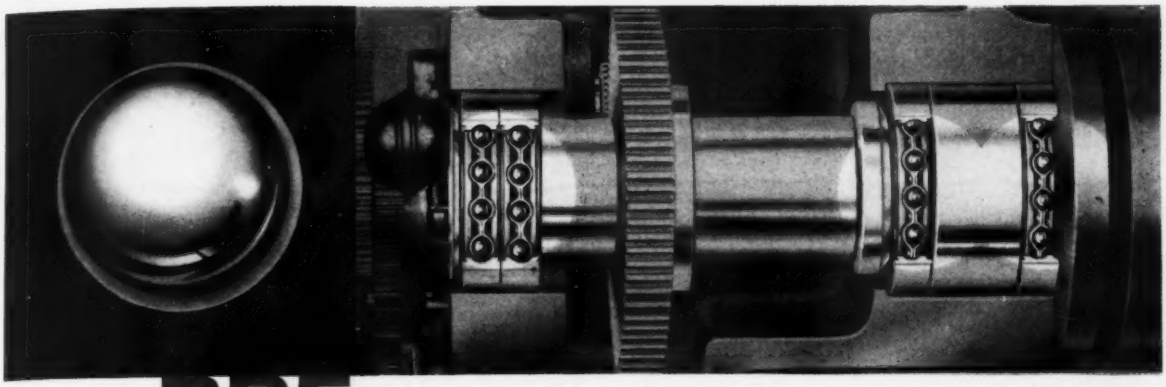
CIRCLE INFORM-A-GRAM KEY NO. 154

DusKolectors and MistKolectors are the subject of an 11-page catalog. Illustrations show the various models of both types of machines and show how they can be used in conjunction with other machines to eliminate dust and mist. Most units

will fit into existing space without rearranging production equipment. Descriptions and advantages of the models are given and there are specification charts, too. Copies of the Catalog 815 are supplied by Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich., or—**Circle Inform-A-Gram No. B24.**

Magnetic Tape for instrumentation recording are the subject of an illustrated booklet. The 8-page booklet covers six types of "Scotch" brand instrumentation tapes for use in machine tool control systems, computers, and other instrumentation applications. Included are charts listing physical and magnetic properties of each of the precision tapes, and a comparison chart summary of major factors in selecting a tape for a particular application. For copies of the catalog contact Minnesota Mining and Mfg. Co., 900 Bush St., St. Paul 6, Minn., or—
Circle Inform-A-Gram No. B25.

A Family of High-Temperature fasteners, having unprecedented static tensile and fatigue strengths at temperatures up to 900° F, is reviewed in a bulletin. Included in the 4-page report are detailed tensile fatigue data, charts, and stress-rupture data on EWB Tm9 fasteners. The advantages and features of these fasteners are discussed, and illustrations are also presented. For copies of the Tm9 report write to Standard Pressed Steel Co., Box 600, Jenkintown, Pa., or—
Circle Inform-A-Gram No. B26.



PRE-SET?

You bet! That's why Spindles on **Logan** *Lathes need no bearing adjustment*

Heavy or light loads, high or low speeds, the ball bearing spindle on a Logan Lathe is always ready to roll. You don't have to set it tight for one job, loose for another.

Why? Because the ball bearings in a Logan spindle are not only pre-loaded and grease-sealed—they're *pre-set* for precision accuracy over a wide speed range. Thus, original spindle accuracy is sustained *far* longer than usual with plain or tapered roller bearing mountings.

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CIRCLE INFORM-A-GRAM KEY NO. 1551

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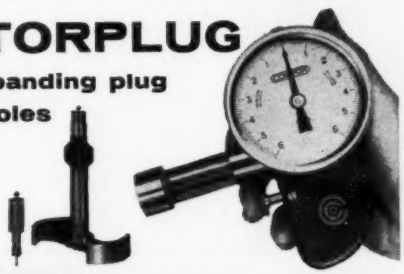
for tolerances down to .0001"

COMTORPLUG

unique expanding plug gage for holes 1/8" to 10" dia.



Large dial graduated to .0001"

Positive 2-point gaging shows size (actual, fixed reading) ovality, front or back taper, etc.

NO PROBLEMS:

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CIRCLE INFORM-A-GRAM KEY NO. 1552

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THROUGH **QUALITY CONTROL AT THE JOB!**

New **MOBILE UNIT takes the GAGES to the Machine**

WRIGHT

PORTABLE INSPECTION BENCH

No need to remove gages from the job and take them to a gage room for inspection. Do the inspecting RIGHT ON THE JOB. Roving inspector easily rolls this new portable unit to any machine location.

Eliminate Costly Scrap at the Machine

Save man-hours, increase production, reduce rejects by 75% with better gage accuracy control. Four drawers for gages, instruments, blue prints and records . . . Fifty foot retractable cord with four electrical outlets . . . Pull-out writing desk . . . Retractable folding seat . . . Floor lock brake . . . 24" x 48" top . . . Height 34" over-all. *Write Dept. B today.*

WRIGHT TOOL CO. 4316 N. Woodward Ave. Royal Oak, Michigan

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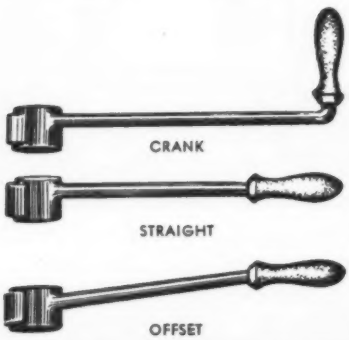
REID TOOL ROOM *Accessories*

MALLEABLE MACHINE HANDLES



Made in straight, crank and offset as shown. Finest on the market. Large variety of sizes. Designed to withstand severe usage. Neat in appearance. Finished ready for use. Moderate in cost.

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Includes scores of other tool room needs such as plastic and steel ball handles, C.I. hand knobs, C.I. hand wheels, compression springs, balanced cranks, clamping levers, etc.

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CIRCLE INFORM-A-GRAM KEY NO. 1561

Illustrated—Logan Super-Matic Cylinder Meets J.I.C. Standards

Look to Logan

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CIRCLE INFORM-A-GRAM KEY NO. 1562

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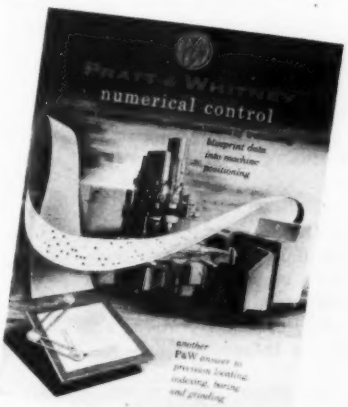
MEDAL MANUFACTURING CO.
328 Vine St., Sharon, Pa. Machined parts, complete machine assemblies, special machinery. Send us your prints for quotes.

"Numerical Control" is the title of a circular published by Pratt & Whitney. The booklet explains what numerical control is and what it can do for those who use it. Sections also present the importance of basic



accuracy, some of the company's numerically controlled machines, and the Electrolimit measuring system. Illustrations and diagrams accompany the discussions. Copies of Circular 609 can be obtained from Pratt & Whitney Co., Inc., Charter Oak Blvd., W. Hartford, Conn., or—
Circle Inform-A-Gram No. B27.

A Complete Line of plastic plugs and caps for protecting internal and external threaded parts, ends of tubes, etc., is described and illustrated in an 18-page two-color bulletin. Over 200 different plastic protectors are discussed, including the quality line, molded from rigid acetate, and the economy line, from flexible vinylite. Major plug and cap designs for each of the lines are described in individual sections, with key specifications given in table form. For copies of Bulletin P 5708 direct requests to S. S. White Plastics Div'n, 10 E. 40th St., New York 16, or—
Circle Inform-A-Gram No. B28.

Advantages of Rockrite Cylinder Finish tubing for cylinders and other applications which require a smooth, close tolerance I.D. are described in a technical bulletin. Along with performance data and application facts, the bulletin explains why this process of forming tubing results in smooth I.D. and O.D. surface, better dimensional accuracy, improved machinability, and better mechanical properties. Bulletin R7A is available from Tube Reducing Corp., Wallington, N. J., or—
Circle Inform-A-Gram No. B29.

An All-Teflon sealed hydraulic cylinder and the radical design innovations which made it possible are described in a 2-color brochure. Features outlined in the booklet include a rod bushing, seal, lock-seal cushion adjustment screw, and a tubing end seal. The advantages of the all-Teflon sealed cylinder are also included. Get your copy from Miller Fluid Power Div'n, Flick-Reedy Corp., 2040 N. Hawthorne Ave., Melrose Park, Ill., or—
Circle Inform-A-Gram No. B30.

A Data Sheet covering a skew loader has been issued by Gear-O-Mation Div'n, Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12. A skew loader is an automatic positioning unit that aligns center-bored parts for easy manual pickup on skews for heat treating. The 2-page data sheet contains a large photo of the equipment and a complete description of its operation and application. Write to the company for copies of Bulletin 570, or —
Circle Inform-A-Gram No. B31.

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PER PRESS STROKE!

Never before such press feeding ACCURACY... such simple compactness!

A "standard" off-the-shelf Rol-Di-Feed so versatile, so economical, it will save hundreds of dollars—do the most rugged press feeding jobs without wonder, worry or waste!

Compact—YES! . . . feeds front to back, back to front, right to left, left to right—and *diagonally!*

That's Versatility plus! A new 12" feed, a new feeding principle, a new profit in *your* press feeding operations!

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Send for literature—have a Dickerman Representative call. Would you like a demonstration on *your* material?

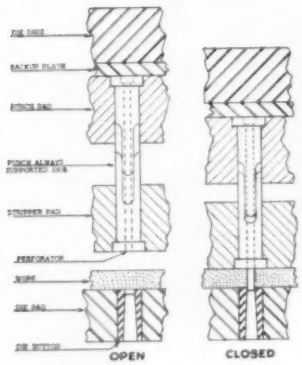
CIRCLE INFORM-A-GRAM KEY NO. 157

A 28-Page Bulletin from Armco Steel Corp. describes briefly the properties of 17-4 PH and 17-7 PH stainless steels. Corrosion resistance, high strength, workability, and hardenability at low heat-treating temperatures are some of the points brought out. Typical mechanical properties and applications of these new, precipitation-hardening steels are included. Write to Armco Steel Corp., Middletown, O., for copies of P. O. 4257, or—
Circle Inform-A-Gram No. B32.

Variable 3-Speed Transmission and two motors are features of an electric sweeper outlined in a bulletin. One motor is for travel and the other is to power the brushes and vacuum. The bulletin also gives specifications for the sweeper in addition to standard equipment and dimensions. For more information about this sweeper, write to Wayne Mfg. Co., 1201 E. Lexington Ave., Pomona, Calif., for copies of the bulletin, or—
Circle Inform-A-Gram No. B33.

Because . . .

WHEN PUNCHING IT IS 100% SUPPORTED BY A TELESCOPING SUPPORT-SLEEVE



Typical Installation

A Durable Perforator stays "alive" longer, because it is supported 100% the full stroke of its Telescoping Sleeve.

You get positive alignment, closer tolerances, burr free holes, regardless of the types of metal used. Holes are punched faster, easier and accurately.

Write For The New DURABLE ENGINEER'S HANDBOOK

121 pages showing 100 Practical Die Designs. NO CHARGE, NO OBLIGATION

Patented and made exclusively by

DURABLE PUNCH & DIE COMPANY

9030 South Hermitage St., Chicago 20, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 158

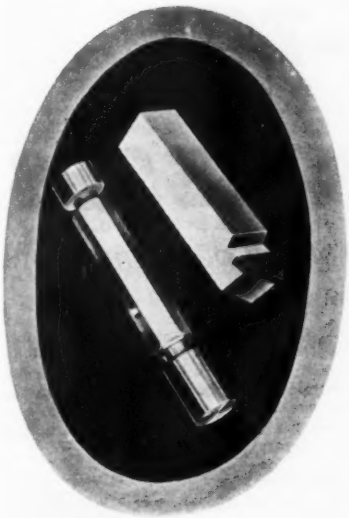
Turntables for industrial applications are detailed in a bulletin. Six models of turntables with illustrations, outline dimensions, and operating data on horizontal and vertical models for loads from 30 to 500 lbs, are featured. Direct requests for copies of Bulletin 1210A to Merkle-Korff Gear Co., 213 N. Morgan St., Chicago 7, or—
Circle Inform-A-Gram No. B34.

Ball Lock interchangeable punches and die buttons are among the items featured in a 66-page catalog. Also included are die sections, diemakers' supplies, plus technical data on die design and operation. This bulletin is being distributed by Acme Industrial Products, Inc., P. O. Box 468, Royal Oak, Mich., or—
Circle Inform-A-Gram No. B35.

Grinding Gages are the subject of a bulletin from Foster Engineering Corp., 4200 N. Woodward Ave., Royal Oak, Mich. They give automatic precision size control on external cylindrical grinding operations. The bulletin illustrates several types of gages, including the Electrosizer, indicator snap gages, and the visual control gage. The advantages, specifications, and descriptions are given for these products. For more information write to the company for a copy of the "Foster Grinding Gages" bulletin, or —
Circle Inform-A-Gram No. B36.

Over 1,000 Different Sizes of washer-dies are listed in a revised bulletin. These dies are suitable for forming all types of taping materials, both ferrous and non-ferrous, and can handle a certain amount of variation in stock thickness. Included are dimensions of blanking and punching dies for plain round washers, round washer dies, slotted washer dies, loading spring for ball bearings, and wavy spring washers. For copies of Bulletin 10M on spring washers write to Associated Spring Corp., Bristol, Conn., or—
Circle Inform-A-Gram No. B37.

A Comprehensive, 16-page manual describing in detail 57 chemical processes has been issued by Turco Products, Inc., 6135 S. Central Ave., Los Angeles. Nine reference charts applicable to the industry are also included. Among the chemical processes discussed in the manual are cleaning, phosphating, conversion coating, protective coating, paint and carbon removing, rust removing, etc. Copies of this catalog are being supplied by the company, or—
Circle Inform-A-Gram No. B38.



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Virgin Diamond particles, graded in our own laboratories, are uniformly dispersed in the exclusive Hyprez vehicle for maximum cutting action. They produce finer results faster on every finishing job... Your nearby Hyprez distributor will help you solve any lapping or polishing problem that may arise.

Write for free demonstration or technical bulletin No. HST-117

HYPREZ DIVISION
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CIRCLE INFORM-A-GRAM KEY NO. 1591

Smoother Production! Higher Output! Lower Costs!

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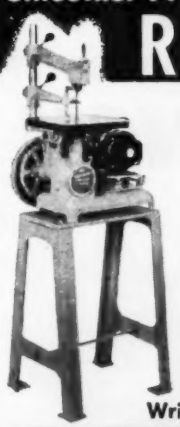


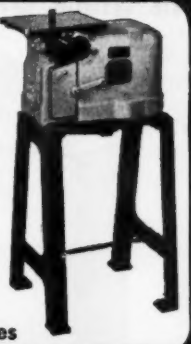
DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.



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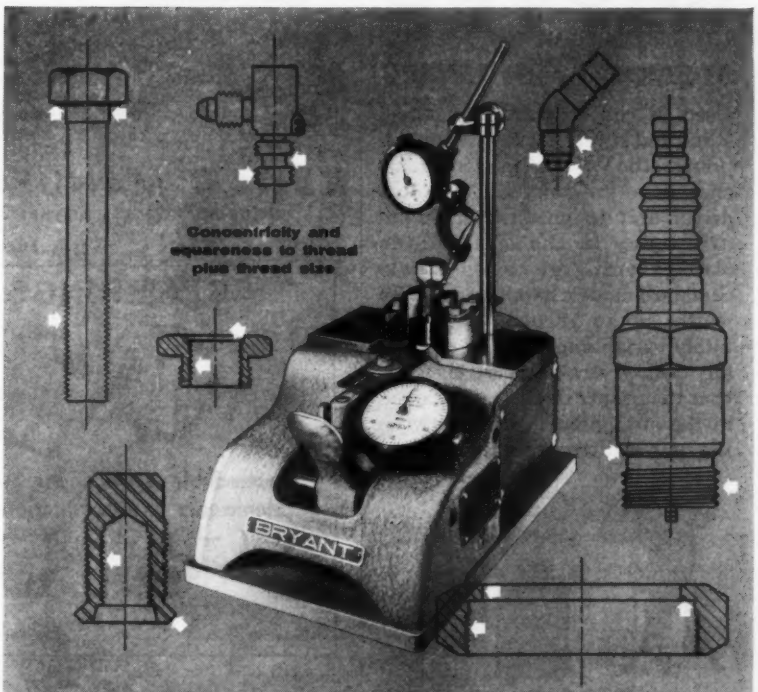

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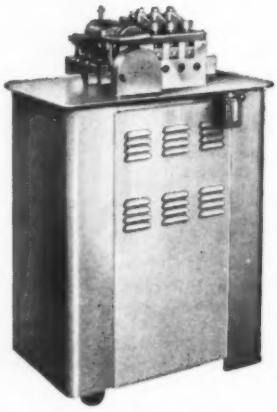
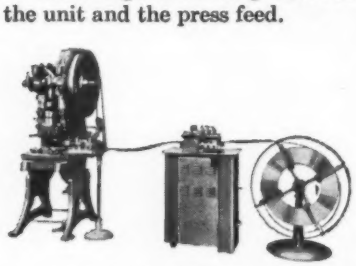
FLEXIBILITY
in Stock Straightening



WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

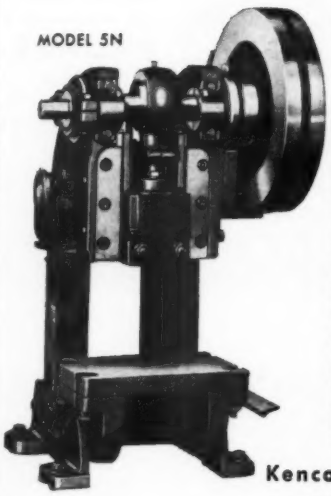
Production Feeding Equipment

4323 W. 24th Place • Chicago 23, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1601

KENCO 5-TON
PRECISION-BUILT
PUNCH PRESSES

MODEL 5N



High speed punching... at low cost

These sturdy presses punch accurately and reliably at speeds up to 285 strokes per minute. Kenco-built for simple maintenance and long life, they save you time and manpower. Rugged, multiple-rib frame has tremendous strength... extra-long ram guides permit full use of the guiding area down to the bottom of the stroke for extra precision.

Six 5-ton models

provide low-cost solutions to many punching problems: Model 5 Standard (variable speed), Model 5-N Standard, Model 5-NR deep-throat (12¾" throat), Model 5-NA Universal 4-in-1 press, Model 5-A Universal Vari-speed, Model 5-R Vari-speed deep-throat.

Kenco presses—14 models—2 to 15 tons

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KENCO MANUFACTURING CO.
5211 Telegraph Road, Los Angeles 22, California

CIRCLE INFORM-A-GRAM KEY NO. 1602

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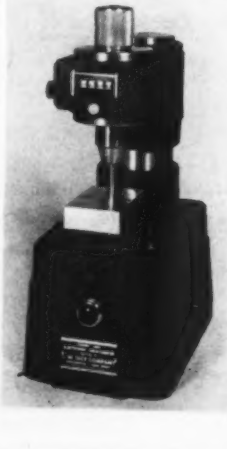

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CIRCLE INFORM-A-GRAM KEY NO. 1604

Automatic Systems for handling ferrous or non-ferrous plate and sheet are described in a 16-page bulletin. The economics of automation in sheet and plate handling, basic applications for automatic handling systems, and descriptions of typical floor-rail, overhead rail, and radial-transfer systems are included. Typical layouts for feeding shears and similar equipment, stacking or transfer from conveyors, restacking from machines, and other applications are shown. Copies of Bulletin B 500 are prepared by Noble Co., 1860 7th St., Oakland 20, Calif., or—
Circle Inform-A-Gram No. B39.

A Casting Ceramic used for high temperature tooling to 3000° F is described in a bulletin. Included is technical data such as density, thermal expansion, and firing shrinkages, and reports on firing procedures, design considerations, and applications for Sur-Braze S-2. This casting ceramic can be applied to brazing, welding fixtures, sintering and glass firing boats, heat treating jigs, and stress relieving fixtures. Bulletin 108 is being distributed by the Duramic Products Div'n, Technion Design & Mfg. Co., Inc., 262-72 Mott St., New York 12, or—
Circle Inform-A-Gram No. B40.

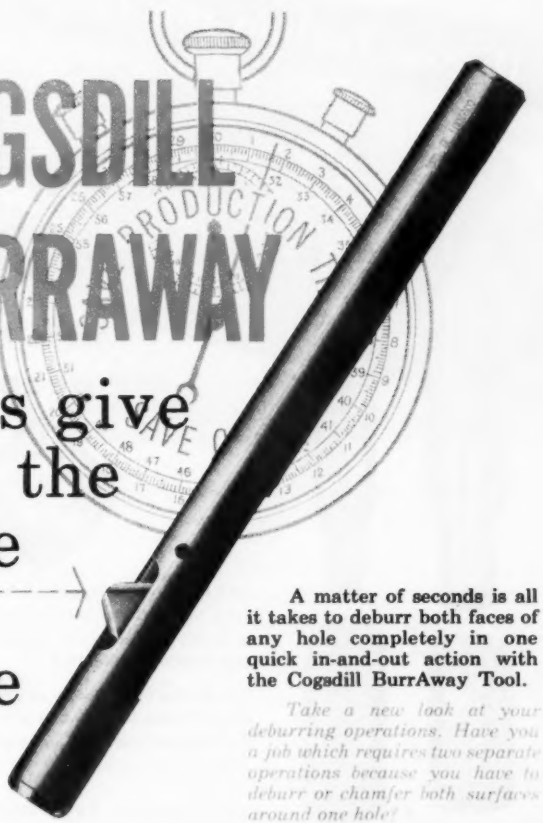
Self-Locking and Self-Sealing Hexagon head cap screws are described in a bulletin published by The Cleveland Cap Screw Co. The bulletin illustrates how cap screws are made self-locking and vibration proof by a patented nylon pellet inserted in the threaded portion of the screws. A table shows the diameter and location of pellets for hex head cap screws available in sizes ¼" through 1" dia, fine and coarse threads. Copies of the bulletin may be obtained from The Cleveland Cap Screw Co., Box 600, Cleveland 28, or—
Circle Inform-A-Gram No. B41.

Hydraulic Presses with capacities ranging from 100 to 3,000 tons are illustrated and discussed in a bulletin. These presses are designed for specific uses, and capacities, platen area, daylight, stroke, speeds, etc. can be determined by the individual customer specifications. For those machines which are illustrated in the bulletin, specifications and advantages are given. For more information about the hydraulic presses write to Williams-White & Co., Moline, Ill., for your copy of Form 76, or—**Circle Inform-A-Gram No. B42.**

Lead Hammer Molds, tubular steel lead hammer handles, and lead hammer alloy are offered by Podlin Tool Co., to those who prefer to mold their own soft hammers. These are described in a bulletin which gives specifications of size, height range, and thickness. Illustrations of each item are also presented. For more information, write to Podlin Tool Co., 11911 Franklin Ave., Franklin Park, Ill., for copies of the bulletin, or—**Circle Inform-A-Gram No. B43.**

An Analysis of 2-H plain and universal milling machines are discussed and illustrated in a bulletin. The wall-chart type folder describes both standard and optional equipment and provides detailed specifications including speeds, feeds, table size, rapid traverse speeds, and other facts concerning capacity and operation characteristics. Bulletin 119 is supplied by The Greaves Machine Tool Co., 2011 Eastern Ave., Cincinnati 2, or—**Circle Inform-A-Gram No. B44.**

COGSDILL BURRAWAY tools give you the edge on time



A matter of seconds is all it takes to deburr both faces of any hole completely in one quick in-and-out action with the Cogsdill BurrAway Tool.

Take a new look at your deburring operations. Have you a job which requires two separate operations because you have to deburr or chamfer both surfaces around one hole?

Call our local representative to show you how this BurrAway Tool can be used in your particular equipment, to give *you* the edge on time.

Cogsdill
TOOL PRODUCTS, INC.
12980 W. Eight Mile Road, Oak Park 37, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 161

A Catalog describing special die sets and bolster plates has been published by the E. W. Bliss Co., Die Supply Div'n, Cleveland. The 16-page illustrated booklet provides ordering data, dimensional charts, etc., for Dieco Allsteel die sets, cast die sets, and special die sets and extras, and also gives data on J.I.C. press room standards for bolster plates. Catalog 70-A, Section 2, is available from the company, or —
Circle Inform-A-Gram No. B45.

Outstanding Features and design characteristics of the self-contained closed-circuit television camera are described in a catalog. Model PD-500 has a built-in power supply and control accessories for complete remote operation. Specifications and mechanical dimensions in diagram form are presented. Direct requests for copies of the bulletin from General Precision Laboratory Inc., 63 Bedford Rd., Pleasantville, N. Y., or
Circle Inform-A-Gram No. B46.

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CIRCLE INFORM-A-GRAM KEY NO. 162

"Baker Basics, for Automation That's Easy to Retool" tells how these standard automation units can be retooled for different machining operations. The basic machine is shown and also retooled for heavy boring and multiple drilling or reaming. The hydraulic slide for horizontal or angular mounting is also discussed along with the three-unit transfer machine illustrating how full automation is possible with standard machines linked together by a conveyor. Bulletin 117 is being supplied by Baker Bros., Inc., Toledo 10, O., or —
Circle Inform-A-Gram No. B47.

A Line of automatic pinch jaw chucks are described and illustrated in a bulletin. Some of the advantages included in the bulletin are uniform and positive pinching on all units, workpiece lift eliminated, wide range of adaptability, and they are used for rough and finish work. Request copies of the bulletin from The Cushman Chuck Co., Hartford 2, Conn., or—
Circle Inform-A-Gram No. B48.

Investment Castings is the subject of a brochure which contains information for cutting costs or improving performance by replacing machined or assembled parts with this process. Clearly outlined are the care and precision demanded in the manufacture of investment castings. The advantages of the process are detailed, and the various steps in the casting manufacture are explained and illustrated. For your copy of this bulletin write to Hitchiner Mfg. Co., Milford, N. H., or—
Circle Inform-A-Gram No. B49.

32 Ideas for the metalworking shop are given in a revised 8-page catalog. Conveniently divided into 5 categories, it shows tools for surface grinders, drill presses, lathes, inspection, and general shop use. There are descriptions of jaws for holding non-ferrous material on magnetic chucks, ball-turning tools for concave or convex radii, or thread triangles for measuring pitch diameter. Get your copy from Montgomery & Co., Inc., 9 Tichenor Lane, Newark 2, N. J., or—
Circle Inform-A-Gram No. B50.

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The new line of "HILLCO" Tangent Chasers, which can be re-ground for 80% of their original length, are guaranteed to be of highest grade tool steels ground to exacting tolerances. We feel that this complete line of chasers are the finest that we have produced in our 75 years of cutting tool manufacture. We think that you will agree with us.

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COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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GAGE COMPANY
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HOLES JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

{ Borrow our instructive 11 minute movie on Jig Grinding. }

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ENGINEERING • PROCESSING • BUILDING • TOOLS
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VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 1633

HOW TO GET ALL THE ADVANTAGES FROM THROWAWAY TOOLING

Many plants lose a good part of the potential benefit in their throwaway tooling programs. But the lost advantages can be regained by using MicroDex inserts. They are processed by a new technique to give you a 25% gain — or more — in throwaway tooling efficiency.

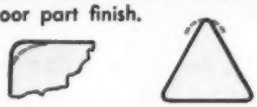
BELOW ARE THE FEATURES REQUIRED IN AN INSERT FOR PEAK THROWAWAY TOOLING PERFORMANCE:

DIMENSIONAL ACCURACY — You want, of course, to be able to index or replace an insert and get the machine under way again without resetting the tool or taking trial cuts. So, dimensional requirements must be far more rigid than formerly thought necessary. (On turning, for example, an insert error is doubled on the part.)

Corner angles must be right | Radii must be accurate and equal | Turnover inserts must have square sides

Valenite MICRODEX inserts are ground by an exclusive new method to give you the most accurate inserts obtainable.

TRUE RADIUS TANGENCY — Corner radii must be truly tangent to the sides. If not, the insert will cut on a sharp point. This reduces insert wear life and makes for a poor part finish.



Valenite MICRODEX corner radii are always perfectly tangent to give you better throwaway service.

FINE SURFACE FINISH – A good micro finish on the insert is essential if you want smooth cutting, good part finish and long insert life.

Compare MICRODEX! Fine finish is a bonus advantage of the MicroDex processing technique.

PREMIUM QUALITY MATERIALS — Processed by advanced methods in the world's finest carbides plant, only the choicest raw materials are used in MicroDex inserts. Yet you pay no more for them than for other inserts!

PROVE IT FOR YOURSELF!

1. Before approving any inserts for use in your plant, check their suitability with the Valenite insert checking kit. (Consists of comparator fixture, dimensional templates for all standard squares, triangles and diamonds.)*
2. Run a side-by-side comparison of insert life, machine downtime, part accuracy and finish using MicroDex inserts and any other inserts. Then specify the insert that gives you more of the advantages inherent in throwaway tooling!

***For complete information write to Valenite's Technical Services Dept.**

VALENITE® METALS
DIVISION OF THE VALERON CORPORATION

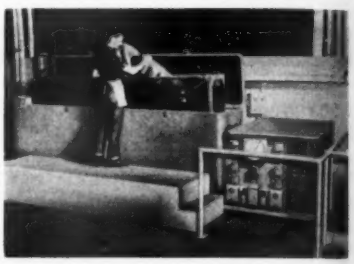
BOX 205
ROYAL OAK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 164

CHILLING UNIT USED TO CURE METALS AND AVOID WARPAGE

Stabilization of austenitic stainless steels and tools is accomplished with a low temperature chilling machine. The unit achieves complete transformation of steel from austenite to martensite without warpage. It decreases hand forming and is considered faster and safer than dry-ice processing.

The machine, used at the Columbus Division of North American Aviation, was developed by Cincinnati Sub-Zero Products to eliminate many of the problems which occur in the conventional heat treatment of stainless steel and will be used extensively for the elimination of retained austenite in the new steels being used in the industry in recent years. Rocket and missile steel, for example, must retain hardness and dimensional stability at elevated temperatures.



The model illustrated has a 47 cu ft chamber, which is 126" long by 18" wide by 36" deep. It has a net thermal capacity of approximately 6,000 BTU/hr at —120° F. Using convection fluid, it will chill 250 lbs of steel/hr from ambient to —120°. For the purposes of faster and more uniform chilling, the chamber is equipped with a ½-hp convection fluid agitator. The water-cooled refrigeration system has two 5-hp condensing units operating on 440 volts, 60 cycle, three phase, with 110-volt control circuit. A mullion heater in the cabinet channel cap prevents condensation of moisture and assures dry cabinet exterior. The chilling chamber, electric welded pressure-tight, is constructed of 7-ga steel and is hot-dipped zinc coated. Rounded corners promote strength and safety.

It is efficient not only for stainless steel hardening, but is also suited for use in any type of production chilling operation. The built-in system of temperature adjustment and quick pull-down from ambient to —120° offer the versatility and speed to meet today's increasing demands.

FOUND WHERE WORLD FAMO... ...ORN"

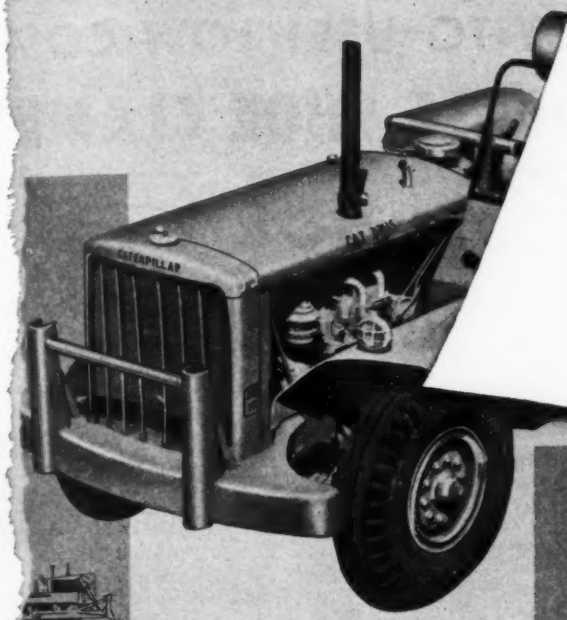
GRAND RAPIDS GRINDE...

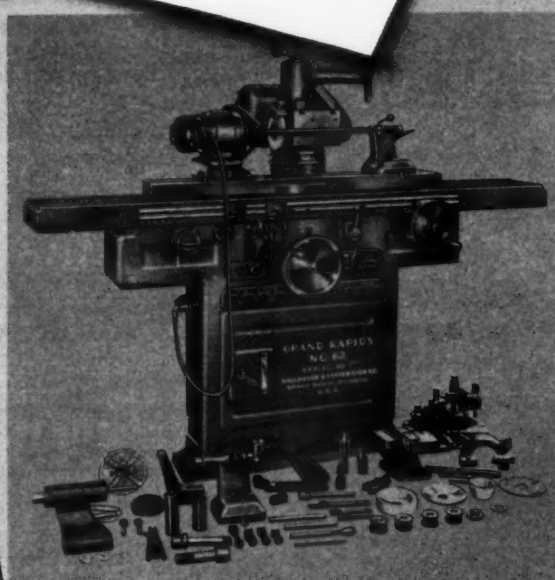
PRODUCTION DEPARTMENT

MEMO TO: Pete

This sounds to me like the grinder we want!

George





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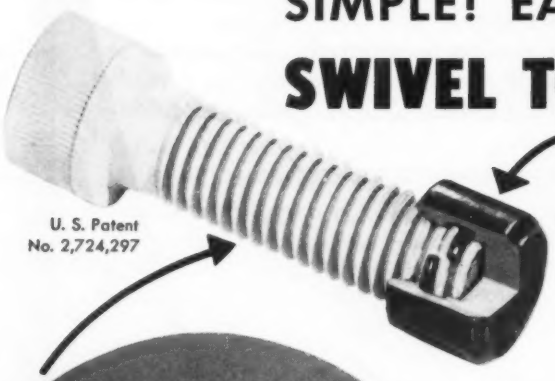
CIRCLE INFORM-A-GRAM KEY NO. 165

New SCREWZON® Pads

SIMPLE! EASY-TO-USE! LOW COST!

SWIVEL TOGGLE SHOE CLAMPS



U. S. Patent
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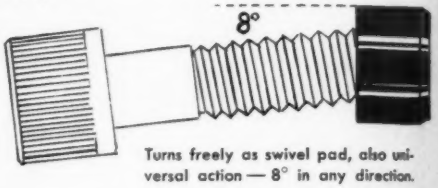
Screws On! Stays On!

The new SCREWZON Swivel Toggle Shoe Pads are the simplest, cheapest, most satisfactory clamps available anywhere! They can be used on ANY SCREW, standard or stock (flat end screws preferable). No machining necessary—NO altering. For any mechanical jaw where "push-and-pull" pressure is required. The new, patented SCREWZON Pads will save you time, trouble and money. Order today!

Screwzon Pads can be press fitted in any jaw.

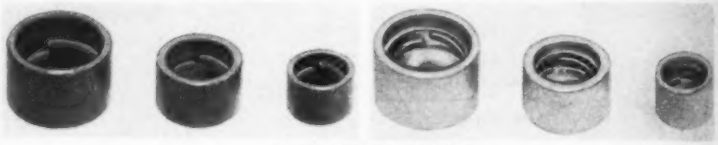
CUTAWAY VIEW OF SCREWZON above, shows the spring insert in each pad. This holds the screw on, but permits free swivel action—8° in any direction.



Turns freely as swivel pad, also universal action — 8° in any direction.

HEAT TREATED—BLACK OXIDE

SOFT-CADMIUM PLATED



O. D. ARE STANDARD

"SCREWZON" SWIVEL TOGGLE SHOE PADS

PRICES AND SPECIFICATIONS

	Screw Size	Code	O.D.	Length	100 to pkg. price each	Price per doz.
HARDENED BLACK OXIDE	5/16-18	SPH312	.437	5/16"	23¢ ea.	$3.48 doz.
	3/8-16	SPH375	.562	3/8"	31¢ ea.	4.44 doz.
	1/2-13	SPH500	.687	1/2"	39¢ ea.	5.64 doz.
NOT HARDENED CAD. PLATED	5/16-18	SPS312	.437	5/16"	22¢ ea.	3.36 doz.
	3/8-16	SPS375	.562	3/8"	30¢ ea.	4.32 doz.
	1/2-13	SPS500	.687	1/2"	38¢ ea.	5.52 doz.

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Standard Parts Company offers the most complete line of fine quality tool room standards available today. All Standard components incorporate the latest safety, efficiency and performance features desired by the trade. You can depend on Standard Components . . . they will never let you down. Our New Sixth Edition CATALOG—covering our complete line—is now ready for you. Tracing sheets are available.

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CIRCLE INFORM-A-GRAM KEY NO. 166

INFORM-A-GRAM — NOVEMBER 1957 ISSUE

DO NOT USE THIS CARD AFTER JAN. 31, 1958

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

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COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

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4	24	44	64	84	104	124	144	164	184	204	224	244	264	284
5	25	45	65	85	105	125	145	165	185	205	225	245	265	285
6	26	46	66	86	106	126	146	166	186	206	226	246	266	286
7	27	47	67	87	107	127	147	167	187	207	227	247	267	287
8	28	48	68	88	108	128	148	168	188	208	228	248	268	288
9	29	49	69	89	109	129	149	169	189	209	229	249	269	289
10	30	50	70	90	110	130	150	170	190	210	230	250	270	290
11	31	51	71	91	111	131	151	171	191	211	231	251	271	291
12	32	52	72	92	112	132	152	172	192	212	232	252	272	292
13	33	53	73	93	113	133	153	173	193	213	233	253	273	293
14	34	54	74	94	114	134	154	174	194	214	234	254	274	294
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295
16	36	56	76	96	116	136	156	176	196	216	236	256	276	296
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298
19	39	59	79	99	119	139	159	179	199	219	239	259	279	299
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
21	41	61	81	101	121	141	161	181	201	221	241	261	281	301

EDITORIAL ITEMS

A1	A10	A19	A28	A37	A46	A55	A64	A73
A2	A11	A20	A29	A38	A47	A56	A65	A74
A3	A12	A21	A30	A39	A48	A57	A66	A75
A4	A13	A22	A31	A40	A49	A58	A67	A76
A5	A14	A23	A32	A41	A50	A59	A68	A77
A6	A15	A24	A33	A42	A51	A60	A69	A78
A7	A16	A25	A34	A43	A52	A61	A70	A79
A8	A17	A26	A35	A44	A53	A62	A71	A80
A9	A18	A27	A36	A45	A54	A63	A72	A81

B1	B10	B19	B28	B37	B46	B55	B64	B73
B2	B11	B20	B29	B38	B47	B56	B65	B74
B3	B12	B21	B30	B39	B48	B57	B66	B75
B4	B13	B22	B31	B40	B49	B58	B67	B76
B5	B14	B23	B32	B41	B50	B59	B68	B77
B6	B15	B24	B33	B42	B51	B60	B69	B78
B7	B16	B25	B34	B43	B52	B61	B70	B79
B8	B17	B26	B35	B44	B53	B62	B71	B80
B9	B18	B27	B36	B45	B54	B63	B72	B81

C1	C10	C19	C28	C37	C46	C55	C64	C73
C2	C11	C20	C29	C38	C47	C56	C65	C74
C3	C12	C21	C30	C39	C48	C57	C66	C75
C4	C13	C22	C31	C40	C49	C58	C67	C76
C5	C14	C23	C32	C41	C50	C59	C68	C77
C6	C15	C24	C33	C42	C51	C60	C69	C78
C7	C16	C25	C34	C43	C52	C61	C70	C79
C8	C17	C26	C35	C44	C53	C62	C71	C80
C9	C18	C27	C36	C45	C54	C63	C72	C81

Which article in this issue was of most interest to you? _____

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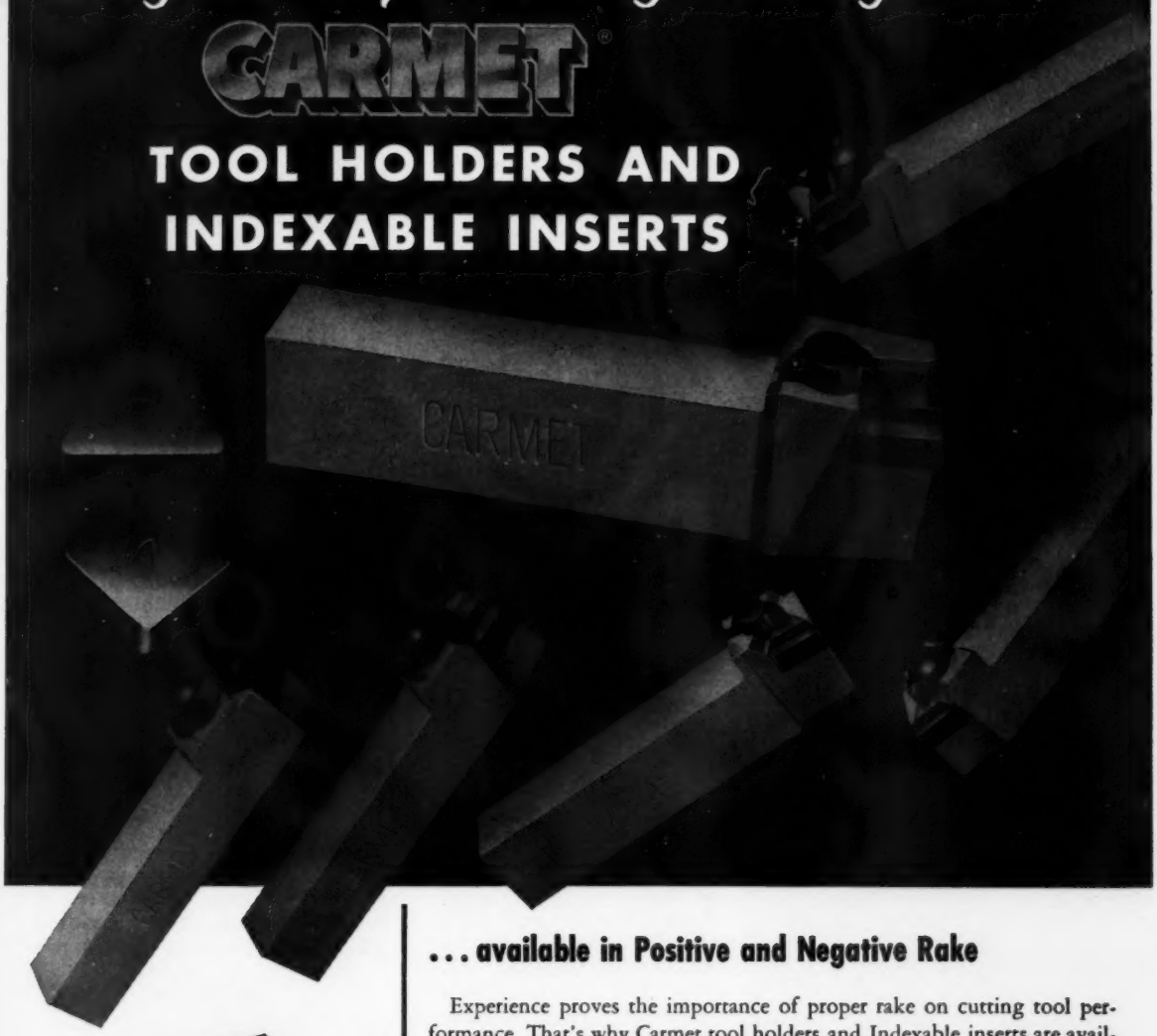
TOOL HOLDERS AND INDEXABLE INSERTS



Write for this NEW CATALOG:
CARMET TOOL HOLDERS and INDEXABLE INSERTS

Expanded to 16 pages, this latest edition contains specifications of Carmet tool holders and Indexable inserts, replacement parts for tool holders, and information on choosing the proper carbide grade for the job.

WSW 6859 ADDRESS DEPT. TP-95

. . . available in Positive and Negative Rake

Experience proves the importance of proper rake on cutting tool performance. That's why Carmet tool holders and Indexable inserts are available in *both* positive rake (for light cutting on easy-to-machine materials) and negative rake (for heavy cutting on high tensile materials).

CHECK THESE FEATURES

- **Up to eight cutting edges on each carbide insert.**
- **Grinding is eliminated—no special reconditioning equipment needed.**
- **Each insert is permanently marked for easy grade identification.**
- **Tool holders cadmium plated to resist corrosion and chip erosion.**
- **Tool holder design permits quick, accurate indexing of inserts to new cutting edge.**
- **Inserts cost but a few pennies per each new cutting edge.**

Ask your A-L representative or distributor for engineering assistance in choosing the right tool for your requirements from Carmet's complete line.
Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.

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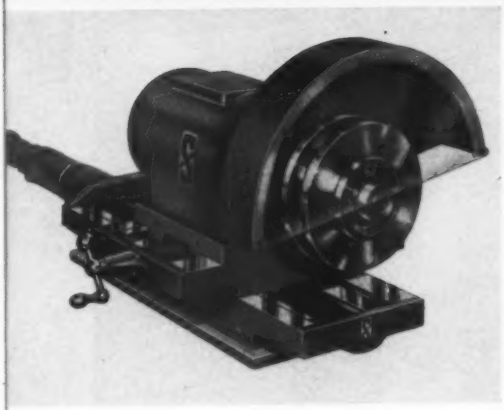
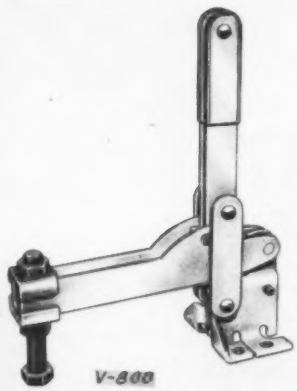


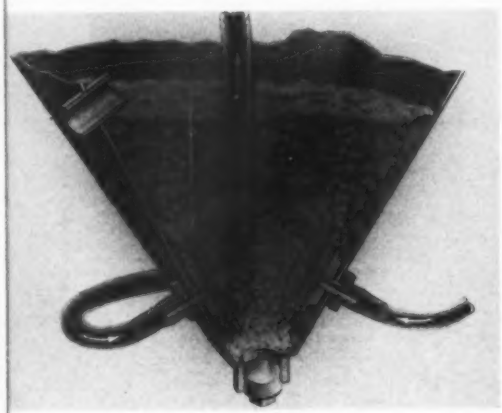
ROLL GRINDER . . .

Because of the need for a 7½-hp, 1800-rpm super precision motorized spindle, a building block unit was built from items produced by The Standard Electrical Tool Co., 2488 River Rd., Cincinnati 4. The spindle has a taper nose to accommodate a balancing type wheel holder for the 20″-dia resinoid bond wheel. **Circle No. A1.**



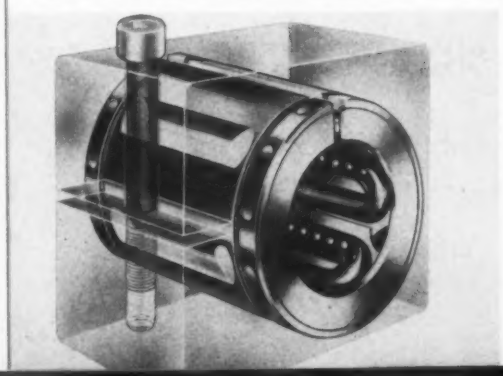
HAND CLAMPS . . .

800-lb load capacity on maximum reach is a feature of the heavy duty hand clamps, another in the Knu-Vise line. They were designed and built for tough holding jobs and are equipped with heavy pressure spindles and horizontal rather than inclined toggle bars. Lapeer Mfg. Co., 1150 W. Baltimore, Detroit 2, or— **Circle No. A2.**



SLURIATOR KIT . . .

Prevent solid packing of abrasive at the bottom of tanks with Sluriator. Abrasives are kept slurried in water for die and mold cleaning, deburring, maintenance cleaning, etc. It eliminates the need for a mechanical pump and auxiliary equipment. Pangborn Corp., Hagerstown, Md., or — **Circle No. A3.**



BALL BEARING . . .

Designed to provide line-to-line or slight preload fits when mounted in an adjustable diameter housing are the adjustable diameter ball bushings. For linear motion, these bushings are available in standard sizes for shaft diameters ranging from 1″ to 4″. Thomson Industries, Inc., Manhasset, N. Y., or — **Circle No. A4.**

BELT GRINDER . . .

Suited for dry, flat surface grinding, polishing, and deburring of castings, die castings, forgings, plastics, etc. is the model PD-10 heavy-duty abrasive belt grinder. The 10″ x 21″ steel

platen can be reversed top for bottom and side for side. The platen offers a working surface large enough to allow parts to contact the entire width of the belt. Hammond Machinery Builders, 1631 Douglas Ave., Kalamazoo, Mich., or — **Circle Inform-A-Gram No. A5.**

MILLING CUTTERS . . .

A line of inserted-blade plain milling cutters for machining aluminum incorporates a patented blade design that provides twice the normal grinding life of inserted blades. They are used in gangs made up of equal num-

bers of right and left hand sections. This arrangement neutralizes end-thrust during machining and permits maximum blade utilization. Cutters using the double life blades come in 4″ wide right and left hand sections. Goddard & Goddard Co., 12280 Burt Rd., Detroit 23, or — **Circle Inform-A-Gram No. A6.**

ON PARADE

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CUT-OFF WHEEL . . .

Receive long wheel life with the BZ2AA reinforced cut-off wheel for off-hand floor stand and swing-frame applications. Recommended for foundry cut-off work, the durable bond makes

it best suited for cast-iron, steel, and the hard, tough, ferrous and non-ferrous alloys. Diameters are available from 12″ to 20″ with hole sizes to fit all standard floor-stand and swing-frame machines. Bay State Abrasive Products Co., Westboro, Mass., or — **Circle Inform-A-Gram No. A7.**

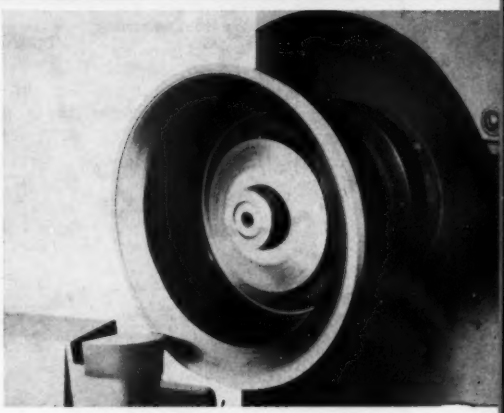
VERTICAL MILL . . .

A feature of the vertical mill is the variable spindle speed drive. It incorporates a rigidly-held rotating head, a vibration-free quill, positive automatic depth control, etc. Speeds are obtainable from 85 to 560 rpm in low

range and from 600 to 3,720 rpm in high-speed range. No changing of belts or gears is required in making a spindle speed adjustment. Spindle speeds can be set exactly with specifications. Fenlind Engineering Co., 5602 Pike Rd., Rockford, Ill., or — **Circle Inform-A-Gram No. A8.**

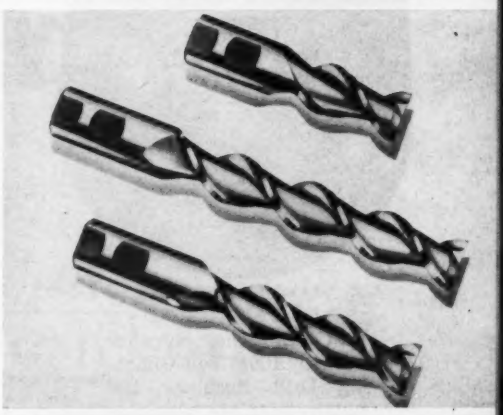
FLARING CUP . . .

Higher production with lower cost per grind is a feature of the B-60 resin bond diamond impregnated flaring cup. It is designed for dry grinding applications of carbide single point and multi-tooth tools. Single passes of 0.005″ dry are now possible. A.I.T. Diamond Tool Co., 8221 N. Kimball Ave., Skokie, Ill., or — **Circle No. A9.**



END MILLS . . .

Two-fluted Hy-Spiral end mills provide the proper shear cutting action that is necessary for fine finishes and long tool life when milling non-ferrous materials. Available in regular, long, and extra long types, they can also be used on ferrous metals. The Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, or — **Circle No. A10.**

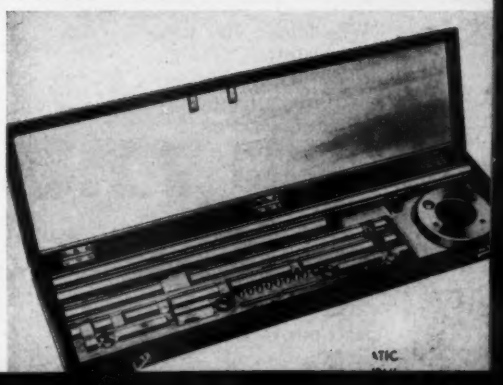


SURFACE GRINDER . . .

Furnished in four bed sizes to handle 11½″ x 38″, 62″, 86″, and 110″ work is the automatic wet surface grinder. It is also available with two types of grinding wheel traverse. Optional features include magnetic chucks and special bed designs. Machine & Tool Div'n, Lempco Industrial, Inc., Bedford, O., or — **Circle No. A11.**

BAR SETS . . .

For gages of extreme length for use where weight is an important factor, use Matrix hollow length bars. Accuracy is 0.000007″. The combination length bars are available in workshop, inspection, and master reference types and grades, and in individual units or sets. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **Circle No. A12.**



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One-hole compression-mounting positively locks bushings into template metal—in one operation. Simple, fast, economical.

No riveting, welding, indexing, nesting—no outboard supports.

High torque and pull-out resistance.

Alignment and center distances secured, automatically.

Permit thin gauge, light weight templates.

Why don't you write for literature and samples for test? Penn Engineering & Manufacturing Corp., Doylestown, Pa.

PEM

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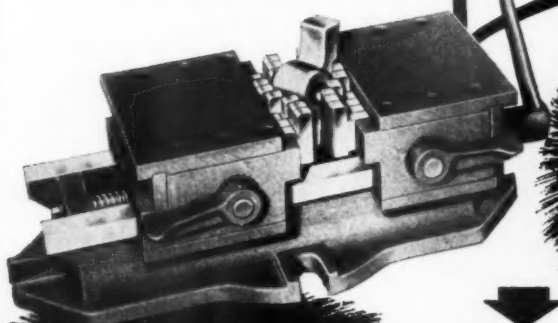

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INSTANTLY GRIPS AND HOLDS ANY ODD SHAPED PIECE

TAKE BIGGER CUTS
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NO MORE BLOCKING SHIMMING HOLDS ANY SHAPE IN ANY POSITION

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This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

Investigate its possible application in your business. Write for further details or demonstration.

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DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
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With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 1703

Monarch Precision SHAPLANE Radius Tools

Illustration shows convex cutter for ¼" to 2½" balls.

FIVE MODELS for LATHES, SHAPERS, PLANERS, BORING MILLS

Range ½" to 3" for concave Radii. Also heavy duty models for radii to 6" on planers, etc.

PATENT PENDING

Write for circular

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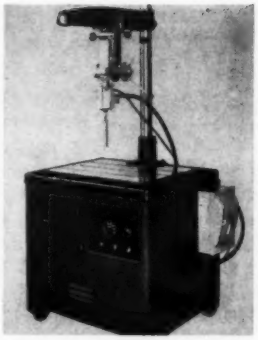
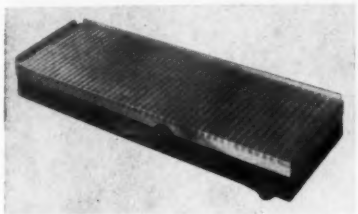
CIRCLE INFORM-A-GRAM KEY NO. 1704

A Disintegrator machine efficiently removes broken drills, taps, reamers, studs, etc. The C-1 has a worktable of 25" x 30" and is for ½" T bolts. Featured is a recessed control panel with 5 point tap switch and an 0 to 100 variable autotransformer powerstat. Jiffy Disintegrator Inc., 1503 E. 11 Mile Rd., Royal Oak, Mich., or —
Circle No. A13.



Auto Speed Camming is a feature of the Torsion spring machine. This is a cam shaft cycling arrangement which makes possible a much greater amount of forming work. Another feature is the electro-grip slide feed with reciprocating cutter tube which grips wire through the use of solenoids. Sleeper & Hartley, Inc., 350 Chandler, Worcester, Mass., or—**Circle No. A16.**

A Permanent magnetic chuck has a work surface of 8¼" x 24" and is used for holding work for milling and planing. When milling or planing, the cutting tool is automatically subjected to a demagnetizing influence during the cutting cycle, be-



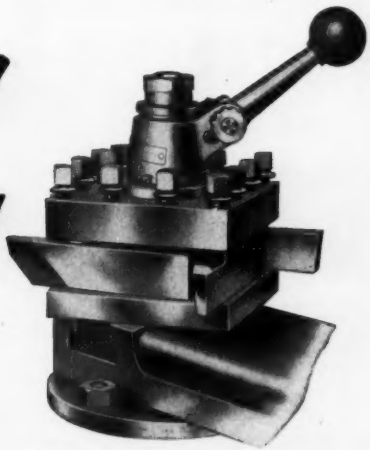
cause the magnets are polorized horizontally rather than vertically. This allows free cutting without chip interference and eliminates the danger of scored surfaces and broken cutters resulting from chip adherence. O. S. Walker Co., Inc., Worcester, Mass., or—**Circle Inform-A-Gram No. A14.**

Deburr and Chamfer slots around the periphery of a part at a production rate of over 200 pcs/hr. Model BMI-15M deburring and chamfering machine has a pushbutton controlled,

completely automatic machining cycle, which makes operation very simplified. Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, or —
Circle Inform-A-Gram No. A15.

Cut Costs!

McCROSKY Turret TOOL POSTS



permit successive tools to be swung into position quickly indexed accurately and locked rigidly

Endorsed by All Well Known Lathe Manufacturers

Multiple tool jobs become continuous when you use McCrosky Turret Tool Posts. They permit engine lathes to handle — efficiently and economically — a wide variety of work that otherwise would require a turret lathe or specialized machine. Ruggedly built. 12 indexing positions. Mount in the T-slot of the compound rest or bolt circle of the main slide. Unsurpassed for performance and satisfaction. Write for a fully descriptive catalog today!

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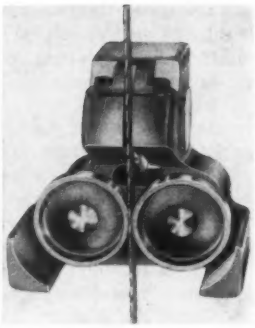
COST CUTTING TOOLS **McCROSKY TOOL CORPORATION** MEADVILLE, PA.

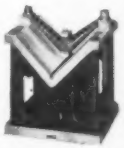
Engineering and Sales Representatives in the Principal Cities

CIRCLE INFORM-A-GRAM KEY NO. 171

A Bandsaw Guide operates on saws cutting any material at any speed or load. It handles blade speeds up to 15,000 fpm and can work equally well on light and heavy loads. The guide will handle thrust loads to 175 lbs at maximum speeds and to 500 lbs at lower speeds. It accommodates saw blades from 3/16" to 2½". Carter Products Co., Inc., Grand Rapids, Mich., or — **Circle No. A17.**



A Gear Driven multiple spindle drill head can be mounted on any drill press to permit drilling from two or four holes at one stroke. Designed to meet applications where up to four holes are to be drilled or tapped at one time, the Model 400 can handle ¼" steel. Commander Mfg. Co., 4225 W. Kinzie St., Chicago, or — **Circle No. A18.**



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Accurately ground to size in pairs. Made from finest quality seasoned grey iron castings. All surfaces except top are square or parallel with each other within .0005".

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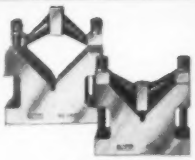
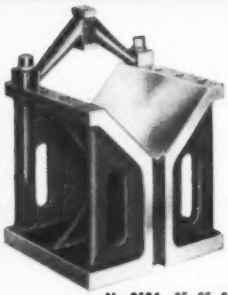


No. 9135-30 STEEL V-BLOCKS
Sold in pairs only. Made of alloy steel, hardened and ground. "V" is central with sides, parallel with bottom, square with ends within .0003". All surfaces square or parallel within .0002".



No. 9134—8" x 8" x 8" V-Block

No. 9131 UNIVERSAL V-BLOCK
Hole in center permits quick, accurate setups. Also provides clearance for tool in drilling and boring. Made of alloy steel, hardened and ground on all working surfaces. All sides square within .0001". Sold singly or in pairs.

Use these standard V-Blocks from tool chest to tool crib, for new speed and accuracy in machining and inspection.

The Taft-Peirce V-Block design combines the tolerances you need with the multiple use you want. No. 9130, for example, can be laid directly on its side with clamps in place. No. 9131 Universal style has a ground and lapped hole in the base for easy locating and to simplify holding parts which must be bored or drilled through completely.

Make sure you have ample quantities of every Taft-Peirce style on hand. They can save important time and cut costs all through your machining and inspection operations. For complete listing of models and prices, contact your nearest representative, or write: Taft-Peirce Manufacturing Co., Woonsocket, R. I.

For *everything* in the tool room . . .

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, R. I.

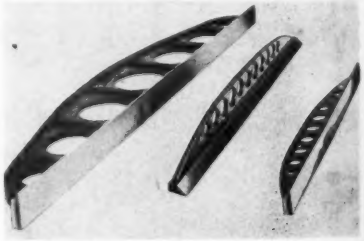
T-P Means TOP Precision

CIRCLE INFORM-A-GRAM KEY NO. 172

Automatically sharpens all circular metal cutting saws from ½" to 14" dia, from finest teeth up to 2 per in, with the saw sharpener. Carbon and high speed steel blades may be ground with equal ease. Arbors are supplied for hole sizes from ¼" to 1" dia. Hamco Machines, Dept. M, 97 Mt. Hope Ave., Rochester 20, N. Y., or — **Circle Inform-A-Gram No. A19.**

Use the Duomatic Machine for roll marking aircraft engine turbine discs. The series 46, model 487, comparable to an air or hydraulic press with vertical ram travel, provides the marking pressure with depth of mark controlled by air pressure as preset at a pressure regulator. Noble & Westbrook Mfg. Co., East Hartford, Conn., or—**Circle Inform-A-Gram No. A20.**

Check Accuracy in scraping the dovetails of machine tool beds with the semi-steel dovetailed straight edges in sizes from 18" to 84" in length. The working surfaces are



accurate to within 0.0002" and the standard unit has one side at a 45° angle. The units come in 9 standard sizes. The Challenge Machinery Co., Grand Haven, Mich., or — **Circle Inform-A-Gram No. A21.**

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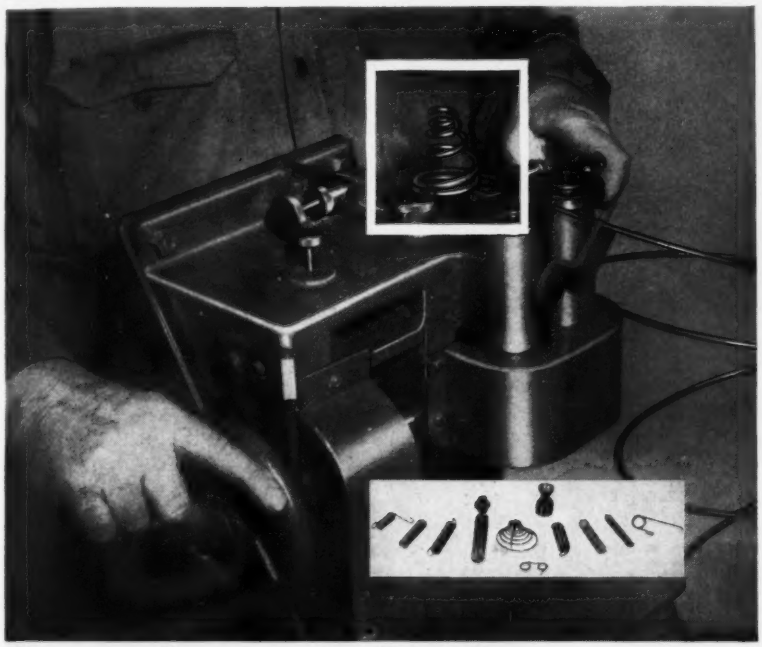

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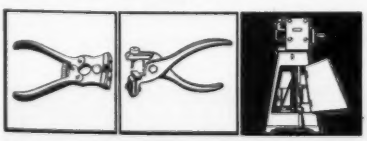
MACHINE AND GEAR CO.
Special Machinery Division, West Springfield, Mass.

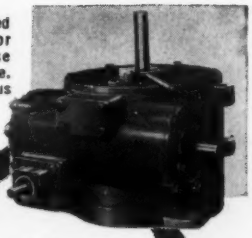


Starret adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

Perkins Machine and Gear Co.
Special Machinery Division, Dept. B2
W. Springfield, Mass.
Please send information and prices on Perkins Spring Coiler.
Hand Model ☐ Power Model ☐

Name.....Title.....
Company.....
Address.....
City.....State.....

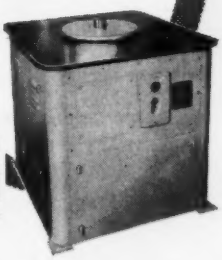
CIRCLE INFORM-A-GRAM KEY NO. 1732



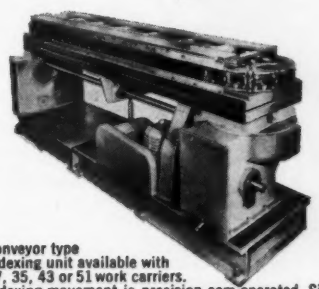
Basic cam-operated indexing unit for special purpose machine drive. Available in various sizes.

The basic units for AUTOMATIC assembly or production

...Standard Tool precision, proved cam-operated indexing units.



Basic cam-operated indexing unit incorporated in standard table with mechanical locking arrangement, timer and drive.



Conveyor type indexing unit available with 27, 35, 43 or 51 work carriers. Indexing movement is precision cam-operated. Side and top machine surfaces allow for ease of tool mounting. Furnished complete with drive.

1. *Reduces design time.*
2. *Permits rapid re-tooling when necessary.*
3. *Wide range of sizes and indexing increments.*

Standard Tool indexing units provide smooth, accurate positioning between automatic production stations. They are built for heavy duty operation and furnish the basic requirement for profitable automation. Engineers at Standard Tool are skilled in manufacture of completely automatic assembly and production machinery into which these indexing units are incorporated. Your inquiries will receive prompt, competent acknowledgement.

STANDARD TOOL & MANUFACTURING CO.

Creative Machine Designers and Builders Since 1910 » » « «

KEARNY, NEW JERSEY

CIRCLE INFORM-A-GRAM KEY NO. 1733

CIRCLE TYPE
ANCHOR BUSHING—
LAMINATE PLASTIC TEMPLATE

STANDARD TYPE
ANCHOR BUSHING—
SHEET METAL TEMPLATE

U. S. PATENT
2483686 ON
METHOD AND PRODUCT.
FOREIGN PATENTS PENDING.
TRADEMARK REGISTERED.

DO PRECISION FREE HAND DRILLING

WITH ANCHOR BUSHING® DRILL TEMPLATES

To eliminate inaccurate hole locations, wrong drill hole size or off-perpendicular drilling, use Anchor Bushing drill templates when doing free hand drilling to obtain interchangeability of parts and economy in high or low quantity production runs.

Anchor Bushing drill templates can be made for a fraction of the cost required for conventional drill tooling. Anchor bushings are riveted or spotwelded to sheet metal or laminated into plastic material.

Any fabrication shop can make its own dimensionally stable drill tooling to fit flat, curved or compound forms without use of expensive equipment or highly skilled labor.

Learn how to do precision freehand drilling, *write for the Anchor Bushing Catalog.*

hi-shear RIVET TOOL COMPANY
2600 WEST 247TH STREET · TORRANCE · CALIFORNIA

Sales Representative for Kirk-Wing Company, Vega Baja, Puerto Rico.

CIRCLE INFORM-A-GRAM KEY NO. 1741

SPEED UP DRILLING & TAPPING JOBS!

JOHN'S DRILL JIG

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/8" to 8" O.D. Will cut tooling and production costs to minimum—10 to 100,000 pieces.

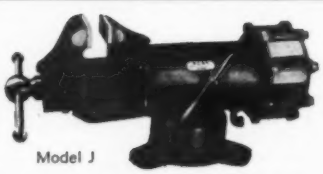
Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

Write for complete information.

HEUSER MANUFACTURING CO.
1642 N. PAULINA ST., CHICAGO 22, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1742

POSITIVE GRIP • SPEED • ADAPTABILITY



Model J

AIR-POWERED TOOLMAKERS VISE
UNIVERSAL DOUBLE SWIVEL

Can be adjusted to any position without removing work from jaws. Furnished with hardened steel jaws and brass caps. Operated by a 6" air cylinder manufactured by Yost. Control kit included with each vise consisting of foot treadle valve, quick exhaust valve and 2 lengths of coupled hose. Jaws can be pre-set to any desired opening. Vise can also be operated manually. Jaw width — 4"; jaw opening — 6"; approx. wt. — 90 lbs.

Write today for bulletin on the complete Yost line

YOST MFG. CO., Cambridge Springs, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1743

Conversion to NYLON-GEAR BY SMALL-LOT MOLDING PROCESS

ACTUAL SIZE ACTUAL SIZE

SAVES 26¢ PER UNIT

This Zytel 101 Nylon Beveled Gear replaced a machined gear that formerly cost 59¢ each. After the initial tooling costs we die-molded it in one operation by our special injection process at 33¢ each.

COST ANALYSIS:
Tooling, set-up and first 100 pieces, including material and trimming..... **$286.00**

Additional 100 lots: $33.00

In addition to a cheaper piece price and equal wearing qualities, the Nylon Gear proved rustproof, noiseless, required no oiling and weighed less.

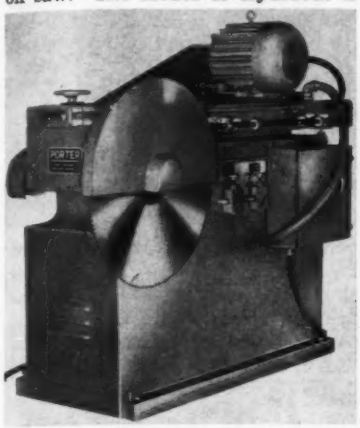
Let us quote on your Short-Run Plastic Moldings. We will gladly submit quotations without obligation.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1744

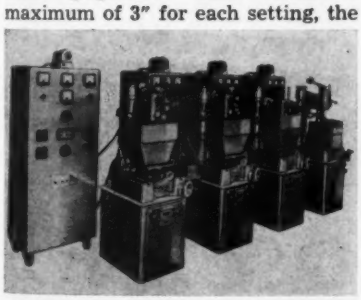
A Hydraulically Operated Carriage adjustable for cutting and return feed speed variations from 0 to 55 fpm is a feature of the automatic cut-off saw. The model 45 Hydracut is



available in two stroke sizes, 24" and 36". This model is designed to meet the heaviest production requirements. C. O. Porter Machinery Co., 666 Front Ave., N.W., Grand Rapids, Mich., or —
Circle Inform-A-Gram No. A22.

Blind Bolts are now available in titanium from Hi-Shear Rivet Tool Co., 2600 W. 247th St., Torrance, Calif. This fastener was designed primarily for normal blind applications where the work is accessible from only one side, for use in minimum clearance areas, for close-out panels, as a nut plate for fastening access panels, etc.
Circle Inform-A-Gram No. A23.

Intricate Outlines and Contours, held to precise dimensions, can be cut through or sunk into hardened metal, particularly in tool and die making, with the Mark III Sparcatron equipment. Head stroke is maximum of 3" for each setting, the



machine table will take a 500-lb load, and control can be manual or automatic. One to four machines can be operated from one main control power unit, and both main and auxiliary units can be operated independently. Easco Products, P. O. Box 587, Ypsilanti, Mich., or —
Circle Inform-A-Gram No. A24.

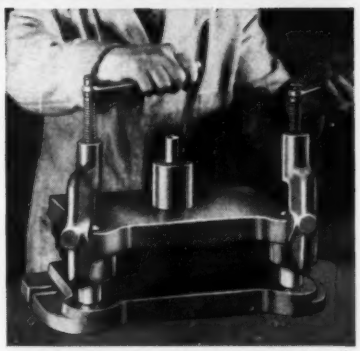
A Line of solenoid valve-piloted air valves has a feature which permits control and operation of the air cylinder without requiring the electrics of the system to be functioning. These are twist-type manual actuators and their use facilitates set-up and try-out of the mechanism. They are available in ⅛" to ½" sizes for use with air or other non-corrosive gases. The Beckett-Harcum Co., Wilmington, O., or —
Circle Inform-A-Gram No. A25.

FOR EASY, FAST, UNIFORM SEPARATION OF DIE SETS . . .

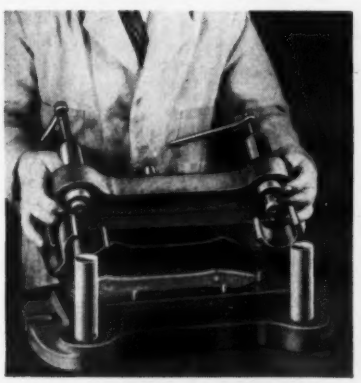
Use These Acro Pullers

When you have die set pullers that remove the punch holder from the die shoe by a straight upward pull and the punch holder slides upward from the die shoe simultaneously from both leader pins, you have Acro Die Set Pullers and you're saving time.

If you're not, this is how it's done with Acro Pullers: *Indexed* screw wrenches act as indicators, controlling the upward travel. This is an exclusive patented Acro feature and found only in ACRO DIE SET PULLERS. It may pay you to investigate. Write for further free information today.



Separate die sets with even upward pull.



Die sets separate evenly and smoothly.

Eliminate wear on Die Sets with ACRO Leader Pin Oilers

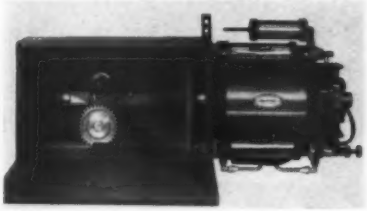
Oilers fit over each leader pin, seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Write for additional information.

OTHER ACRO TIME SAVERS FOR YOUR SHOP include drill rod racks, wing nuts and lubricators. Write for complete descriptive folder. Ask for DP-57.

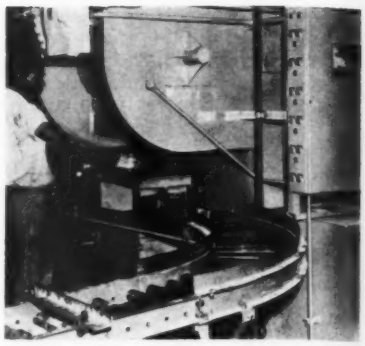
ACRO METAL STAMPING CO.
336 E. RESERVOIR AVE., MILWAUKEE 12, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 175

Designed to power the feed on multiple drilling applications is the Hy-Torque heavy duty power feed unit. Model HDPF-170 has a basic unit which consists of a steel gear rack which drives a pinion gear mounted on a shaft with a hub as the drive unit. The 3000 in-lbs maximum torque delivered at the hub may be applied to any cross-fed shaft or driven shaft for rotational or linear movement. The Bellows Co., Akron 9, O., or —
Circle Inform-A-Gram No. A26.

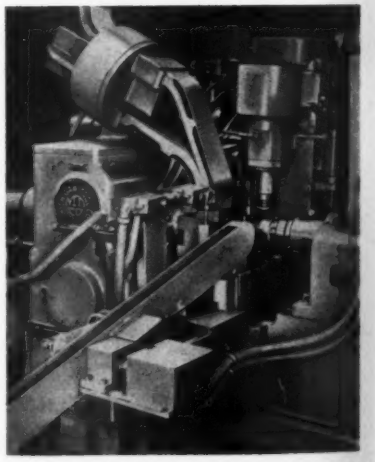


The Roto-Jet automatically washes, rinses, and dries screw parts coated with quenching oil and simultaneously cleans the tote pans containing the screws. Model RJ-WRD heats by steam, is operated by one man, and processes a tote pan of parts every minute at normal operating speed. The machine is readily adaptable for efficiently cleaning stampings, small castings, and machine and electrical parts. Industrial Systems Co., Matawan 1, N. J., or —
Circle Inform-A-Gram No. A27.



An Automatic Loader, unloader, and stacker has cut time required to load large metal sheets or plates on presses from 50% to 80%. This product loads and unloads metal up to 48" x 84" and up to 400 lbs. It was designed primarily for use with Wiedemann turret punch presses equipped with a direct measuring table and gage. Additional information may be obtained from Wiedemann Machine Co., 667 Wissahickon Ave., Philadelphia 32, or —
Circle Inform-A-Gram No. A28.

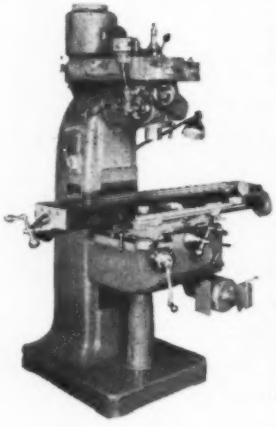
An Automatic Orientator for feeding parts into a hobber properly positioned for back hobbing has been added to a line of automated loading and unloading devices. This method almost doubles output of a single-spindle hobber. Hob life is extended because the hob enters the cut only once. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or —
Circle Inform-A-Gram No. A29.



Produce MORE... Produce it BETTER!
ON THESE IMPROVED ECONOMICAL
INDEX VERTICAL MILLS

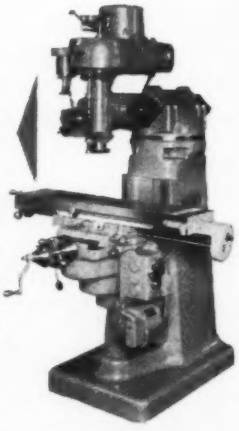
Super "55" MILL

1½ HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.



Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.

"45" MILL

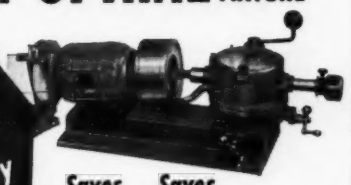


INDEX MACHINE CO.
541 N. MECHANIC STREET JACKSON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 176

Super MULTI-SPIRAL END MILL GRINDING FIXTURE

SHARPENS END MILLS Quickly... Completely IN YOUR OWN SHOP



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For grinding or milling of any spiral lead. Pays for itself in a hurry. Send for facts today.

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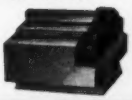
Cut Operations 75% or More!

Custom-designed, precision made, exactly to fit your needs. Boost both output and quality. Ask for details.



SPIRAL STEP TOOL COMPANY

Designers and Manufacturers of All Types of Special Cutting Tools

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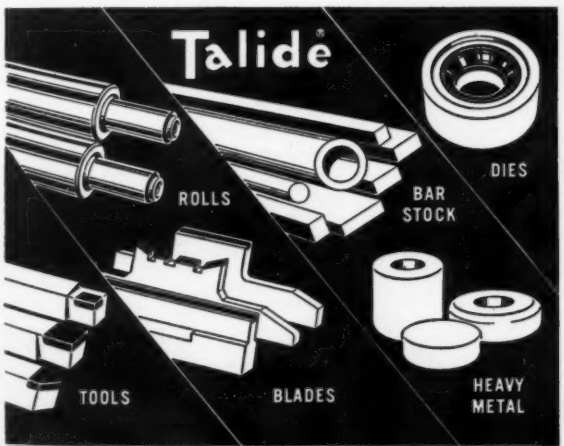
Phone: LOngbeach 1-5384

CIRCLE INFORM-A-GRAM KEY NO. 1771

Talide®



HARDEST MAN-MADE METAL!

• New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
MC TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

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New **CATALOG**

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GRINDING WHEEL ADAPTERS

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finest quality **ADAPTERS**

- Precision-made, Hardened and Ground with Heat Treated Nuts
- Complete Line—4 New Models Available
- For Use on All Popular Surface Tool and Cutter Grinders
- Large Stocks—Immediate Delivery

USE SOPKO ADAPTERS—SAVE TIME, TROUBLE AND MONEY

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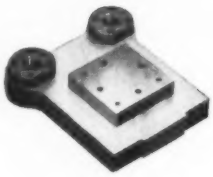
CIRCLE INFORM-A-GRAM KEY NO. 1773

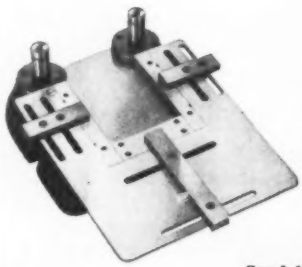
Punches and Dies

Notching Die with Gauge Table

Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.



This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.



25th ANNIVERSARY 1937 1951

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

Send for free illustrated catalog No. 154 AF. Net prices shown.

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1781

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your source for dependable
DRILLHEADS

Universal Joint Type Drillhead . . . Full Ball or Bronze Bearing Construction, Standard or Heavy Duty. From ½" minimum centers up. Capacities to ½" in Steel.

Gear Driven Eccentric Type Adjustable Drillhead . . . Enclosed, Full Ball Bearing Construction. Double Eccentric Type Adjustable Drillhead illustrated.

- We stock or can build the right drillhead for your jobs.
- Write for your free copy of the THRIFTMASTER CATALOG or phone for a rush, on-the-spot, quote.

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Special Fixed Center Drillhead . . . Made to your requirements. Full Ball Bearing Construction.

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INSERTED BLADE GENESEE
FACING AND COUNTERBORING TOOLS

- Interchangeable Pilots
- Constant Chip Space Throughout Life of Blades
- Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks
- H. S. S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
WRITE FOR CATALOG 54P

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566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1908

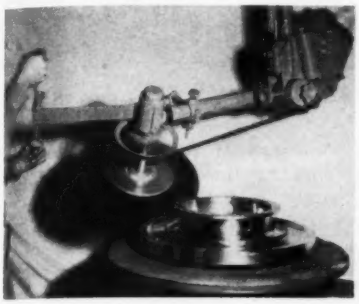
CIRCLE INFORM-A-GRAM KEY NO. 1782

Aget offers more! Over 38 standard Dustkop models to choose from . . . *Plus* engineering service to help you select, provide, and install the proper accessories and fittings to complete your dust collecting system. Write for illustrated folder . . . Today!

AGET MANUFACTURING COMPANY
1394 E. CHURCH STREET • ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1784

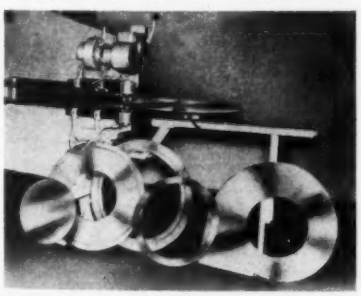
The Vannegut Brush-Backed Polishing Head has been mounted on a suspended Vannegut 6-72 unit permitting deburring, clean up, feathering, or polishing operations quickly and economically. The 6-72 tilts and



swivels to any desired position; making the 16 or 32 brush Vannegut heads, in any of several diameters and face widths, adaptable to most job requirements. More information can be obtained from Grinding and Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, or — **Circle Inform-A-Gram No. A30.**

Suitable for general brazing, cast-iron welding, and cast-iron brazing with the oxyacetylene process is a welding flux known as the Ampco-Braz Flux No. 2. Excellent wetability, non-fuming and non-toxic, ability to depress filler metal bubbling and fuming, deep penetration, providing strong joints, and protection against excessive oxidation, are some advantages. Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 46, or — **Circle Inform-A-Gram No. A31.**

An Outside Circle Cutting Attachment has been designed for use with some Pullmax universal shearing and forming machines. On the larger models a power feed is available and when the outside attachment is used



in conjunction with this feed, it doubles the capacity and versatility of the machine. The outside attachment is normally supplied in 4' lengths, but any length may be obtained. American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, or—**Circle Inform-A-Gram No. A32.**

Used for Precision Measurement of fragile or compressible non-conducting materials and parts is the digital read-out automatic electronic micrometer. Measurement is within 0.000020". Model JDR has a measuring range of ½" and a throat depth of 2". Upper head is adjustable in height to accommodate work up to 1½" thick. Pressure on the work can be set for a negligible amount if the work is extremely fragile or compressible. J. W. Dice Co., Englewood, N. J., or — **Circle Inform-A-Gram No. A33.**

JOHNSON
Johnson Model J A big, rugged saw that cuts anything—anywhere! 10" rounds, 18 flats, heavy structurals and odd shapes. Available in wet or dry cutting models, variable speed drive and optional equipment.
Johnson Model B Also available in wet or dry cutting models, variable speed drive. Will easily handle 5" rounds, 10 flats, odd and irregular shapes.
Johnson "Mobile" Model M same capacity as Model B, but wheel-mounted for fast, easy maneuverability indoors or out. Has self contained handle, power line, tool box for accessories.

MORE SAW for LESS MONEY

Only Johnson offers so much saw for so little money. Whether your requirements call for the tremendous performance of the big Model J, the amazing Model B, or the versatile "Mobile" Model M, there's a Johnson saw model, wet or dry, to match your metal cutting needs.

Remember... Johnson offers three husky, handsome models that'll do the job faster, better. They're beautifully engineered, semi-automatic, have centralized controls—plus many exclusive features that pay production dividends to *you!*

Priced right? Certainly! Compare them all before you buy and you'll agree, Johnson offers more saw for less money.

Write today... **Ask for illustrated literature, specifications and prices on the full line of Johnson saws. Ask the man who has one... You'll be glad you did!**

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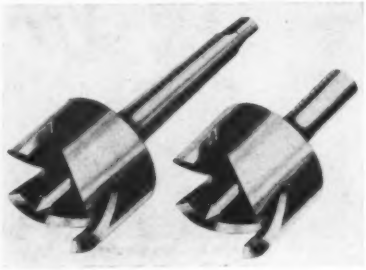
CIRCLE INFORM-A-GRAM KEY NO. 179

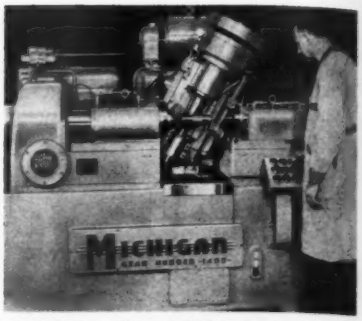
Produce Perfectly Concentric and practically burrless holes in sheet and plate materials to ¼" thicknesses with the Roto-Bor. It utilizes four cutting lips, instead of two, and is counterbored to increase its cutting speed, cutting depth, and ease of re-sharpening. The Roto-Bor is available in 1/16", 1/32", and 1/64" sizes from 13/16" to 2 1/32", and was specifically engineered for hole-cutting in thicker and tougher materials. Jancy Engineering Co., 508 S. Pine St., Davenport, Iowa, or —

Circle Inform-A-Gram No. A34.



A High-Speed Gear Hobber is a horizontal single-spindle machine that is versatile enough for small shops, yet easily installed in automated gear lines of big plants. Model 1458-B has an 8" center distance between hob and work spindle. It has an inboard-mounted guide assembly that introduces the lead to the work spindle while the work is being traversed across the hob. In operation, the hob is plunge fed into the work by a Z-bar mechanism, eliminating the approach feed and offering a reduction in hob time. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or —

Circle Inform-A-Gram No. A35.

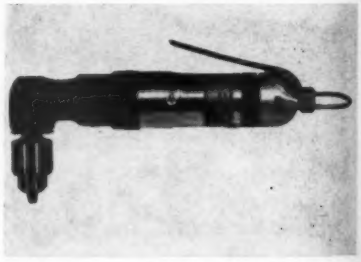


The Belt Driven grinding spindle is suitable for bore grinding operations on parts such as gears, valves, or die sets. Another grinding spindle model with a direct connected spindle can accomplish grinding operations on OD or ID and associated surfaces where the versatile feed directions of the spindle-slide assembly are used to their greatest advantage. These two grinders are the Frauenthal 1200 Series single spindle vertical precision grinders. Frauenthal Div'n, The Kaydon Engineering Corp., Muskegon, Mich., or —

Circle Inform-A-Gram No. A36.

Drill in close quarters and hard to reach places with an angle air drill. Well-balanced for easy handling, the Keller Tool 11G-2 series angle air drill has a heavy duty spiral bevel gear drive. Advantages include interchangeable gears, one shot lubrication with flush type fitting, and capacities up to 5/16". Gears and drive spindle are ball-bearing mounted. Gardner-Denver Co., Quincy, Ill., or —

Circle Inform-A-Gram No. A37.



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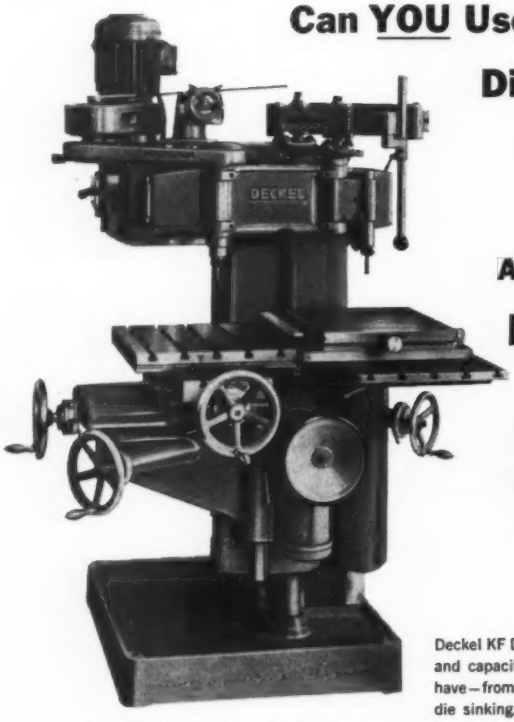
Available On A DECKEL Universal Pantograph Die-Sinking Machine



Deckel KF-12 Die Sinker with power lift motor for raising or lowering work and pattern tables simultaneously

OTHER DECKEL FEATURES

Optical Tracing
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Line-By-Line Milling
Automatic Depth Feed
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Deckel KF Die Sinkers have the versatility and capacity to take any job you might have—from light engraving to the heaviest die sinking. Their wide range of application lets you handle more work with less equipment. A Deckel KF-12, for example, can accommodate dies and molds up to 1300 lbs., and offers cutter spindle speeds from 60 to 10,000 rpm. Deckel KF machines can duplicate directly at a 1:1 ratio, enlarge or reduce up to a 1:4 ratio. Rugged pantograph construction and play-free bearings assure accurate, easy control of all operations.

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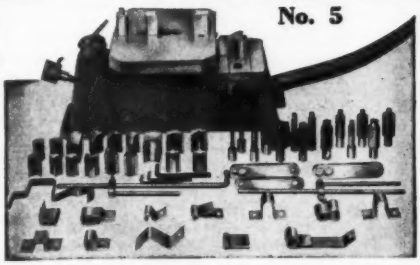

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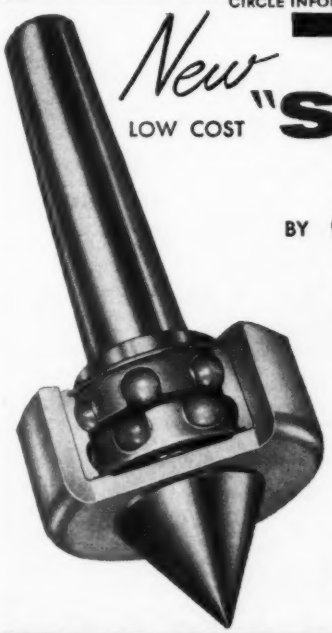

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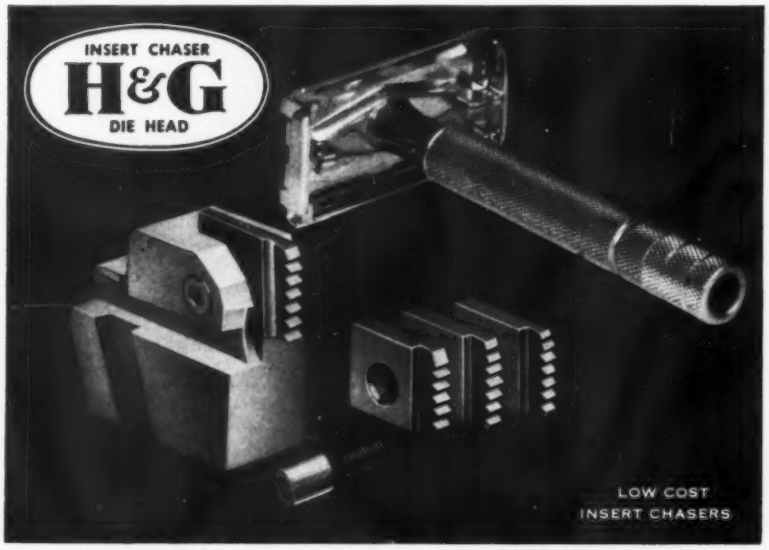

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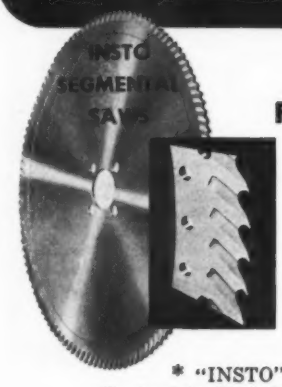

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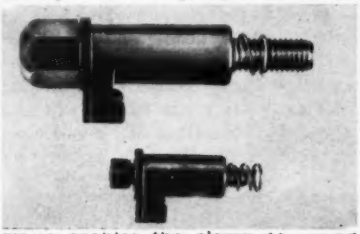
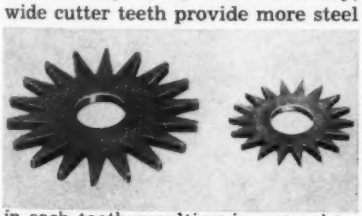
of approximately double the rate of the average square cut shear. The friction clutch allows accurate control. The Production Machinery Corp., Dept. TP, 39805 Mentor Ave., Mentor, O., or —
Circle Inform-A-Gram No. A38.

Safe Work Holding, fast clamp release in restricted spaces is a feature of a swing clamp. For quick maneuvering, the swing clamp assembly utilizes a spring loaded shaft



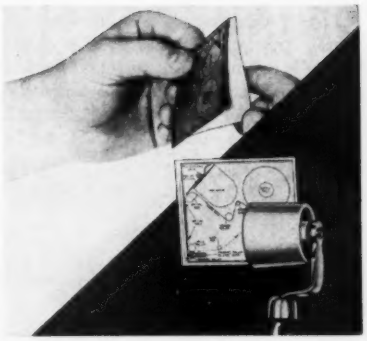
which enables the clamp to swing quickly and easily out of the way of the fixture and the work. Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, or —
Circle Inform-A-Gram No. A39.

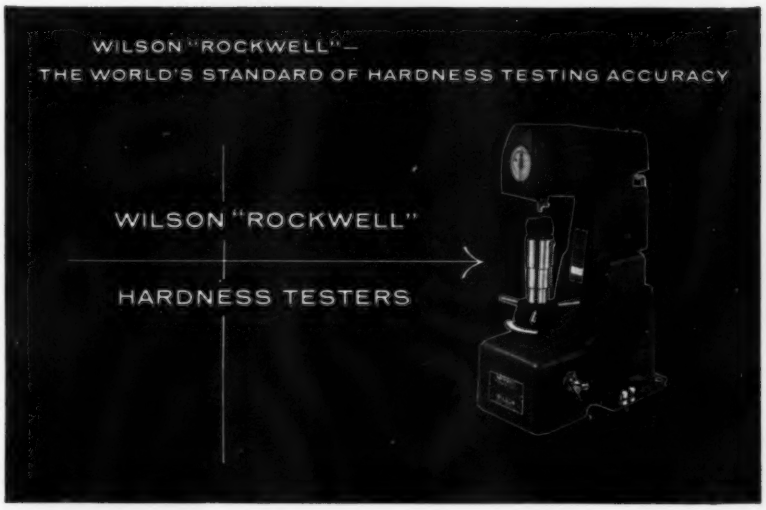
Greater Wear and longer life are features of the Huntington style cutters. They are milled, of extra high carbon alloy steel, and the heavy, wide cutter teeth provide more steel



in each tooth resulting in extra life. These cutters are available in number O, 1¼" dia; number 1, 1½" dia; and number 2, 2⅜" dia. They are engineered to fit all makes of Huntington type dressers. Machine Products Corp., 125 Hollier St., Dayton, O., or —
Circle Inform-A-Gram No. A40.

Only Ten Seconds are required to apply the deep-anodized, self-bonding metal nameplate made by W. H. Brady Co. Quick-Plates have a permanent pressure sensitive adhesive that requires no activation by water, solvent, or heat, and the plates don't need holes, pins, screws, or fasteners. Simply remove the release liner and apply. They stay bonded to surfaces through a temperature range of —62°F to 325°F. W. H. Brady Co., 727 W. Glendale Ave., Milwaukee 9, or—**Circle Inform-A-Gram No. A41.**





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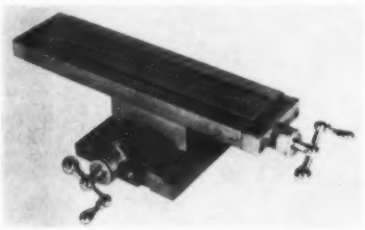
CIRCLE INFORM-A-GRAM KEY NO. 183

For Producing Holes in drill-jig plates and similar work where extreme accuracy is desired use the Ateco compound table. Intended for attachment to the accurate drilling machine, the table consists of a workbed capable of being adjusted to two directions at right angles to each other. The movements are controlled by leadscrews of accurate pitch, fitted with micrometer collars reading in increments of 0.001", a greater degree of accuracy than 0.002" being obtainable. The working surface is 15" x 4¼". Air Transport Equipment, Inc., Amityville, N. Y., or —
Circle Inform-A-Gram No. A42.



From Tool-Up to Finished Production of fine pitch gears in less than 6 hrs with the Gerite (TM) fine pitch gear generating machine. This machine is used for model and prototype work on critical military and industrial equipment. It also performs economically on a production basis — generating p-2 and p-3 gears without hand selection and time and material waste. Illinois Tool Works, 2501 N. Keeler Ave., Chicago, or —
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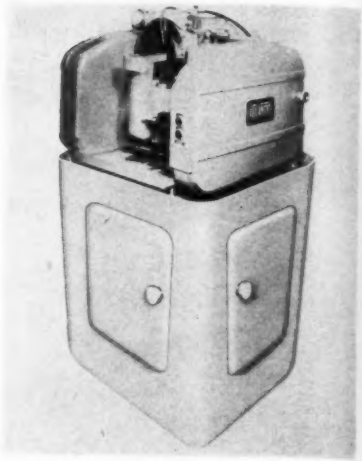

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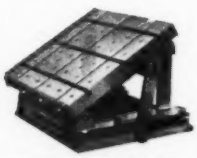
This simple, fast, sure method sets up any angle, single or compound, right or left hand, without V-blocks, angle plates or complicated "build-ups." Complete range of models and sizes puts Robbins precision equipment within the reach of every shop. Write now for literature.



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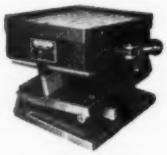
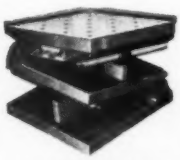


"MAGNA-SINE" WITH MAGNETIC TABLE



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South Bend 9" Precision Lathe

- Highly adaptable—easily tooled.
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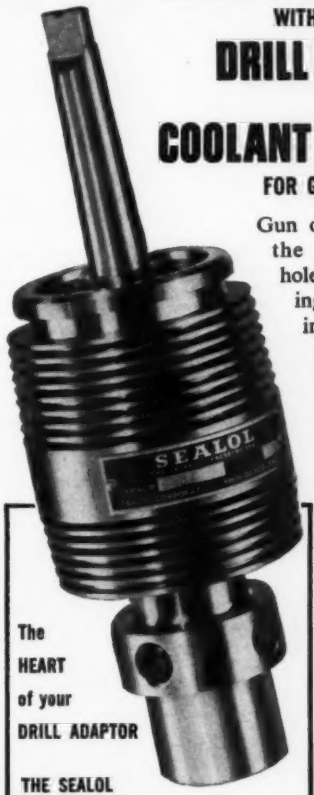
WITH SEALOL'S
DRILL ADAPTOR
AND
COOLANT SUPPLY UNIT
FOR GUN-DRILLING



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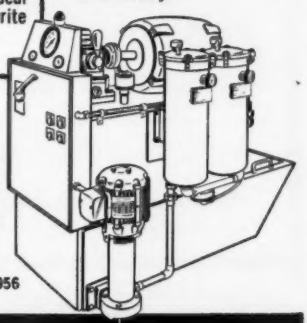
Gun drilling has revolutionized the production of accurate holes. For example, gun drilling saved $12,674.52 in drilling three shallow holes in each of 342 breech rings at the Watervliet Arsenal. Manufacturing methods engineers say that production time was cut by 71%!**

Your plant can save substantially and increase production by adapting your present drilling equipment for gun drilling with Sealol's Drill Adaptor and Coolant Supply Unit.

SEALOL DRILL ADAPTOR — transfers coolants from a stationary source to the rotating gun drill at speeds to 10,000 RPM — pressures to 1,000 PSI. Coolant is delivered through gun drill directly to cutting edge. Work runs cool, chips are flushed out continuously.



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*to Gun Drill Tolerances
**American Machinist — Aug. 13, 1956

SEALOL CORP

DEPT. M. WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.

Please send me Bulletin information on Sealol gun drilling equipment.

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CIRCLE INFORM-A-GRAM KEY NO. 1853

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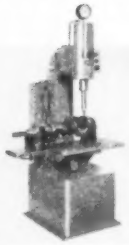

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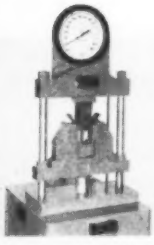


... or more like this?

Steel City Guided Bend Testing Machine makes qualification tests on butt-welded specimens in accordance with AWS and ASME standards. Exclusive design provides automatic ejection of tested part. Unskilled operator makes perfect test.

... or *different* entirely?

Steel City Tensile Tester (hydraulic, hand operated) determines strength of graphite samples. Self-contained unit simplifies tensile testing operation, releases more expensive equipment for other work. Adaptable for powdered metal, other specimens.

Whatever your testing problem

Steel City may *already* have a practical solution.

Brinell Hardness	Ductility	Tensile
Compression	Transverse	Hydrostatic
Proving instruments	Write today for FREE literature.	
Flex-Tester	Steel City Testing Machines Inc.	

8815 Lyndon Avenue, Detroit 38, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1861

ECONOMY

"A Name To Remember"

– whenever your duplication requirements call for the standard tool items illustrated here. Stocks at ECONOMY are always complete – assuring you of quality and service.

Descriptive Bulletins, Prices, and Dimensional Data Sheet No. 7-A upon request. Ask for prices on salvaging worn-out plug and ring gages.

ECONOMY TOOL & MACHINE CO.

1828 South 68th Street Milwaukee 14, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1862

DEKA® BORE

cuts setup time 300% at FORD PLANT!

THE PLACE: FORD MOTOR CO., AIRCRAFT ENGINE DIVISION, CHICAGO

THE JOB: BORING HIGH ALLOY STEEL LINERS IN MAGNESIUM HOUSING (36 Rockwell "C")

REPORT BY: TOOL ENGINEERING DEPT.

"Bore diameter tolerance is plus or minus .0003". There's an edge wear of .0001" to .0002" on the tool bit in the initial pass. Before, each final pass took several time consuming adjustments. We changed to a Deka-Bore boring head, and cut setup time 300%, because the Deka-Dial permits positive .0001" adjustment on all settings, in a few seconds. No backlash, either."

DEKA® BORE

OFFSET BORING HEADS BORING BARS REPEAT TO .0001" IN 30 SECONDS! 100% GUARANTEED!

Attach this ad to your letterhead for free demonstration or literature!

PRECISION TOOL & MFG. CO. OF ILL.

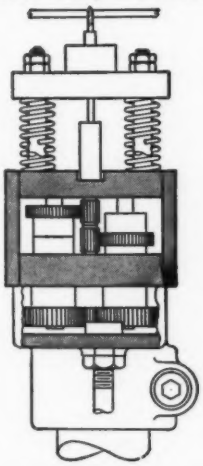
1305 South Laramie, Cicero 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1863

The No. 15 Drilling Machines, tappers, and accessories introduced by Buffalo Forge Co., Buffalo, N. Y., have many refinements in design which facilitate operation, maintenance, and flexibility. The complete line includes bench, floor, and pedes-

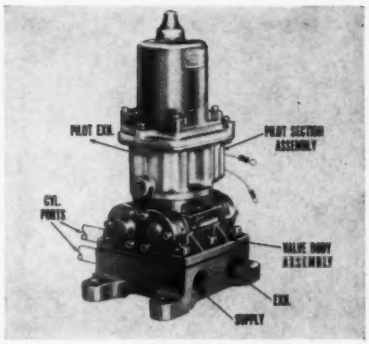
tal models. Bench and pedestal types are available in 1 to 6 spindle models. These machines can be used for small hole drilling. Improvements include front mounted start-stop pushbutton switch, depth gauge graduated for easy setting, and three grip spindle feed.
Circle Inform-A-Gram No. A45.

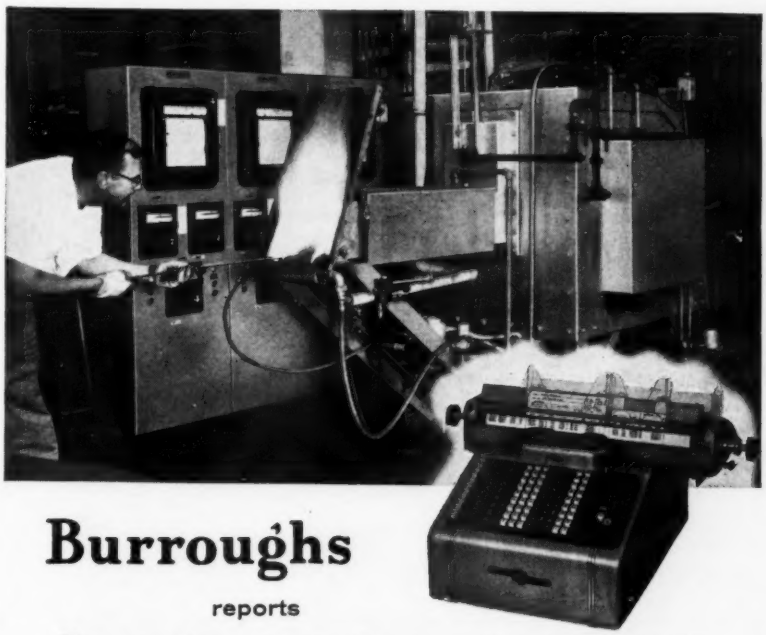
Eliminate Close Center Drilling problems with a multiple drill head attachment and an automatic index table. The units can produce any type of part pattern of holes on a close center. They drill linear, oval,



circular, zig-zag, or more complex and irregular arrangements. The drill head attaches easily to a drill press, spindle, or other power unit and requires only one source of power. ConRay Corp., 29 W. Apple St., Dayton, O., or —
Circle Inform-A-Gram No. A46.

Designed to spring return to normal operation or to be easily locked in the actuated position is the Gold-model valve. It has a locking manual actuator which is O-ring sealed. This large-capacity pilot section is actuated by an oil immersed solenoid. 90° turn of the actuator will lock the solenoid in the energized position. These valve bodies include straight way, normally open and normally closed, threeway, etc. Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, or —
Circle Inform-A-Gram No. A47.





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reports

"No Scaling, No Oxidation, No Distortion," in this HEVI-DUTY High Temperature Furnace

The Plymouth Division of the Burroughs Corporation uses a Hevi-Duty High Temperature Furnace to harden all high speed tools and dies used for machining the Sensimatic accounting machine.

Parts come out of this furnace clean and bright due to the careful control of an endothermic atmosphere within the furnace and cooling chambers. The water jacketed cooling chamber enables Burroughs to bring the temperature of the parts being treated from 2300°F to 150°F before removal from the furnace.

If you are seeking similar results, write today for Bulletins 153 and 653.

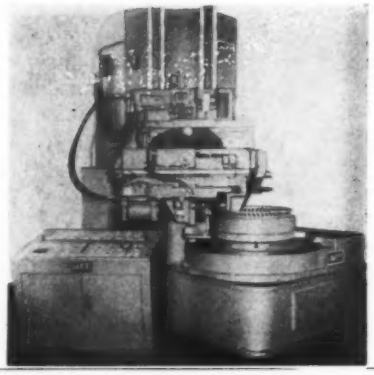
HEVI-DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

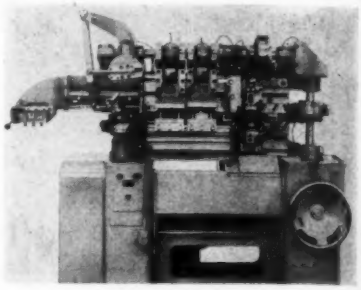
Dry Type Transformers ***Constant Current Regulators***

CIRCLE INFORM-A-GRAM KEY NO. 187



A Version of the Jacy Precision Index and Pierce machine featuring an index table which is accurate to seconds of arc is available in tonnages up to 65 tons. It is used to perforate or form annular rings varying in size from 16" to 54" in diameter. The index table features infinite resolution from 1:21,600 divisions of a circle. The Jacy table is provided with automatic and manual control and has a solid mechanical lock with zero backlash in all positions. This eliminates the need for cams, index plates, change gears, etc. Modern Engineering Service Co., 2695 W. 12 Mile Rd., Berkley, Mich., or — **Circle Inform-A-Gram No. A48.**

Superior Visibility and accessibility to all parts of the machines, particularly the tooling area, are features of the Verti-Slide, an all-purpose vertical four-slide machine. Floor space is saved because this machine is only half the size of a horizontal machine. The center form is



mounted in the bed, providing both a stronger and more rigid mounting and a better view of the tooling area. An extra large mounting plate enables large tools to be fastened securely and economically. The Torrington Mfg. Co., Torrington, Conn., or—**Circle Inform-A-Gram No. A49.**

Adaptable to Feed Both Rolling and sliding parts at pre-set speed, special model 2500 elevating feeder provides full automatic parts flow from a barrel conveyor line into machines. It handles piston pins in conveyor barrels, feeds them properly

oriented, and at any desired constant speed. Angle of elevation, depth of conveyor cleats, and left or right hand power take-off may be varied to handle widely varied parts and conditions. Feedall, Inc., 38399 Pelton Rd., Willoughby, O., or — **Circle Inform-A-Gram No. A50.**

ARE YOU USING- HOVIS UNIVERSAL Master COMPOUND DIES

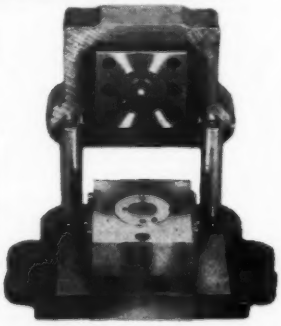
to Produce WASHERS and SMALL STAMPINGS from all Types of Materials the ECONOMICAL WAY?

SAVES

DESIGNING COST
TIME • LABOR
MATERIALS
STORAGE SPACE

The "MODERN METHOD" adopted by MANUFACTURERS NATIONALLY

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART



● By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

Made in 5 sizes:
¾" - 1½" - 2½" - 4" - 6"

Specialists in designing and manufacturing MULTI-DIES as well as supplying COMPLETE TOOLING FOR ALL SIZES OF NUT FORMERS

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HOVIS SCREWLOCK COMPANY

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LARGE CAPACITY GRINDING PROBLEMS SOLVED AT MICRO PLANE!

Write for descriptive literature

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CIRCLE INFORM-A-GRAM KEY NO. 1891

LEAD HAMMERS—Buy Cook "SHUR-GRIP"

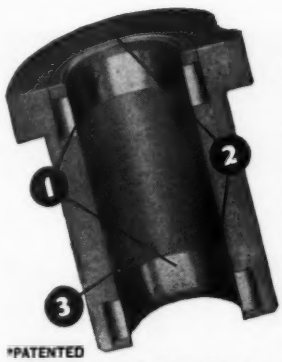
They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

Write for circular and prices

LAWRENCE H. COOK, INC.
48 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1892

INCREASE PRODUCTION.. SAVE TIME & MONEY



*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 41

MEYCO

Carbide Inserted Bushings Are Doing It Daily!

How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

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W. F. MEYERS CO., INC., BEDFORD, INDIANA

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Expanding Mandrels

Accuracy 001" - No Distortion

No Slipping - Everlasting

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1896

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

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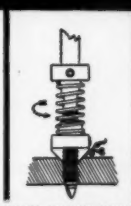
UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

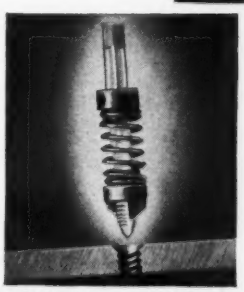
CIRCLE INFORM-A-GRAM KEY NO. 1893

TAP AND DEBURR IN ONE OPERATION

Slip a BURR-BIT onto any make tap and holes are automatically deburred while they are being tapped. Save money, time and labor by COMBINING TWO OPERATIONS INTO ONE.



AS TAP IS WITHDRAWN, BURR BIT DEBURRS, LEAVING CLEAN CHAMFER



First thread which creates burr, has been AUTOMATICALLY, QUICKLY AND PRECISELY REMOVED, leaving perfectly smooth finish for easy screw insertion.

Precisely engineered of finest quality high speed tool steel for use on almost every material. The BURR-BIT is used by many large and small manufacturers throughout the country.

For full information and specifications on the BURR-BIT, write to

VERNON DEVICES, Inc.
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NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS . . . *UNMARRED* BY TOOL WITHDRAWAL MARKS

THE NEW **RELIEVOMATIC SELF-RELIEVING TOOL HOLDER**

SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS

Avoid scratches like this

All clear with "Relievomatic!"

Easily installed on cross-slide or turret

Write today for details.

SILBER PRODUCTS, INC. Nightingale 9-8600
870 Essex Street • Brooklyn 8, N. Y.

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PALMGREN

GET THIS FREE CATALOG on Work Holding Tools NOW!

Used in all industries . . . everywhere

This catalog shows the most complete line of work holding tools available anywhere for production on milling machines and drill presses . . . angle vises . . . drill press vises . . . swivel machine vises . . . adjustable angle plates with or without swivel bases . . . production vises . . . heavy duty angle vises . . . rotary and indexing tables for use on milling machines and drill presses . . . milling attachments for milling on lathes.

There are 68 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories, with jaw sizes from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today, showing the complete line, details and prices.

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CHICAGO TOOL and ENGINEERING CO.
8388 SOUTH CHICAGO AVE. • CHICAGO 17, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1901

LAYOUT FLUID

IDEAL FOR TOOLMAKERS & MACHINISTS

TRIAL OFFER

Send me my order of D-R LAYOUT FLUID right away! Bill me ☐ Bill my company ☐

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2 FOUR OZ. "BRUSH-IN-CAP" CANS

$1.00

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7B, MINNESOTA

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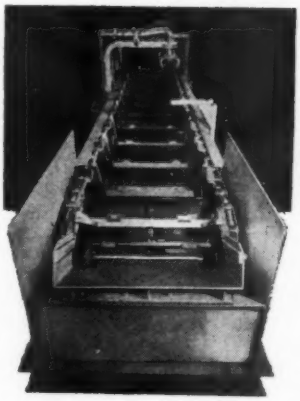
AUTOMATION COMPONENTS



Automation fixture to pre-heat, solder and air cool neck on gas tank.

Ready, at a moments notice, to step into the breach in constructing identical components to any engineering requirements:

✓ Economically
✓ Accurately
✓ On Time

Write for free book titled "Engineering Data"

COMPOSITE FORGINGS, INC.
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Phone TAshmoo 5-3226

CIRCLE INFORM-A-GRAM KEY NO. 1903

AIR-MITE

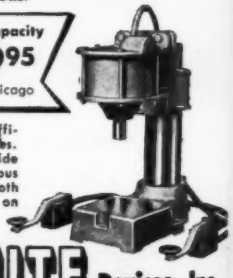
HIGH PRODUCTION AIR PRESS
with more Quality Features

★ **Solid Steel Column. Greater strength and rigidity.**
★ **Brass cylinder, aluminum end castings, Hy-Car piston cups.**
★ **Accurately ground table.**
★ **Fast set-up and stroke adjustment.**

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a workhorse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

1 Ton Capacity
$89.95
F. O. B. Chicago

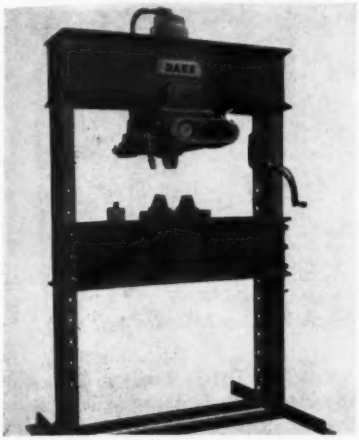


New 3 Way Control Valve. For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.

AIR-MITE Devices, Inc.
4405A W. KINZIE • CHICAGO, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1904

Four Tonnage Capacities is a feature of an air-operated hydraulic shop press. This unit is used for bending, straightening, and other press work. A feature is the rapid ram approach which entirely eliminates the use of a hand wheel. When

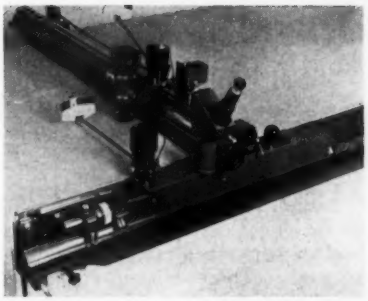


the control knob is turned, the ram advances at high speed until it comes in contact with the work, then automatically changes to the power stroke. Dake Corp., Grand Haven, Mich., or —
Circle Inform-A-Gram No. A51.

Holes up to 18" in depth can be drilled with the ram-type radial drilling machine. With the compound angle attachment, holes on any compound angle can also be drilled by rotating drill head in two

planes. The machine has a drilling area of 14.8 sq ft and handles workpieces over 4' high and over 4' in dia. The complete ram and head assembly rotates on the column 360° and the column has a vertical movement of 12". The I. O. Johansson Co., 7248 St. Louis Ave., Skokie, Ill., or —
Circle Inform-A-Gram No. A52.

A Coordinatograph for plotting over a 60" x 120" working area has been announced by Aero Service Corp. Model E was developed for special applications in aircraft and automotive lofting. It is also useful in graphic plotting of scientific data. Readings of the glass dials are projected on screens at 50 times actual size. Accuracy in the longest dimension is ±0.004", and in the Y dimension it is ±0.002". Aero Service Corp., 210 E. Courtland St., Philadelphia 20, or —
Circle Inform-A-Gram No. A53.



GREIST MICRO-SCRIBERS®
mark hard metals fast!

Now in 2 sizes... Heavy-Duty and Slim-Line

Solid carbide tip stays sharper, longer! Scribes fine lines on hardened steel, ceramics, plastics, gems, glass.

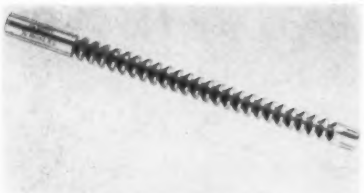
Diamond lapped to correct tip angle that gives you fast, easy, close-tolerance layouts.

Hexagonal aluminum body—anodized for extra protection. Packaged in clear "plastic bubble" that protects precision tip.

Order a half-dozen from your Greist distributor today! Specify **Heavy-Duty** or **Slim-Line.** Only **$1.00** each.

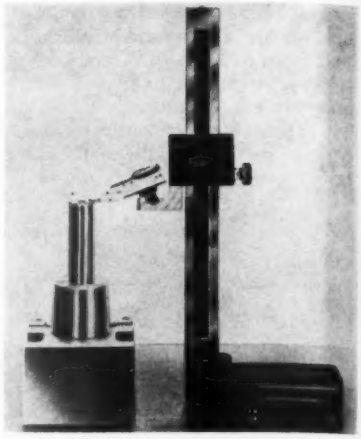
THE **GREIST** MANUFACTURING COMPANY
4811 Blake Street, New Haven 15, Connecticut
Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 191



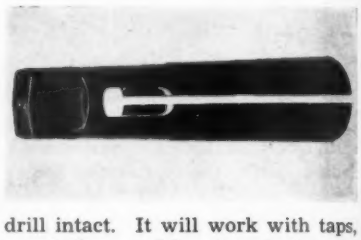
Round, Push-Type Broaches make round holes with close tolerances and are perfectly straight all the way through. These machines can be used with the shop arbor press or with a hydraulic press. Chatter marks, rings, and run-out are eliminated, no special tools are required, and they finish to exact size in one pass. Thirteen sizes are available. The duMont Corp., Greenfield, Mass., or—**Circle Inform-A-Gram No. A54.**

The Check Master Height Gage is adjustable to consistant 0.0001" accuracy for use with the test indicator which responds to dimensional variations as low as 0.0002". As the base does not protrude beyond the column, maximum clearance is assured for close positioning. Tight coupling of the gage eliminates errors in indicator readings caused by over-hang



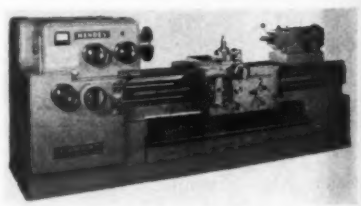
leverage. Standard Gage Co., Inc., Poughkeepsie, N. Y., or — **Circle Inform-A-Gram No. A55.**

Reduce Drill Breakage, scored spindles, and damaged chucks with the straight shank, Dupont nylon drill sleeves. Because of the nature of the nylon, this sleeve will break under sudden shock and leave the



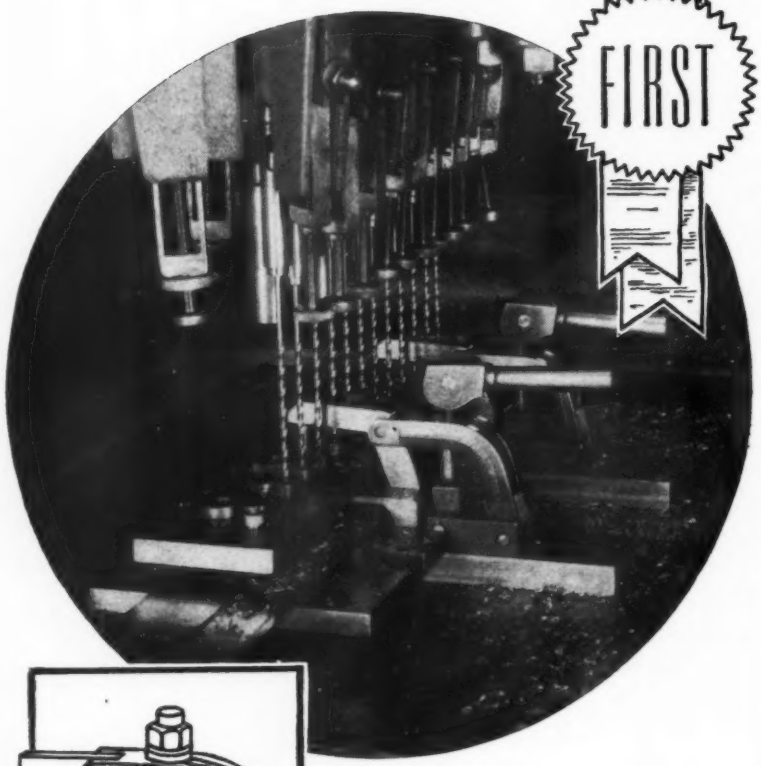
drill intact. It will work with taps, counterbores, deburring tools, etc. They are unaffected by coolants, oil, gasoline, or grease. Morse taper OD sizes of 1, 2, and 3 with a full range of inside diameter sizes. James Products Co., Mentor, O., or — **Circle Inform-A-Gram No. A56.**

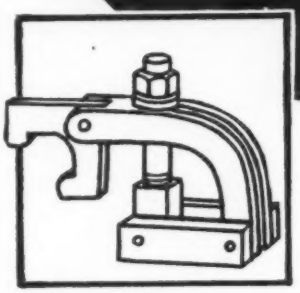
21" and 25" Swing over bed ways is a feature of two new 32-speed, all geared head lathes for toolroom and production turning. The many features include multiple-thread indexing spindle which permits cutting



any number of threads divisible into 48, and quick-change threads per inch range from 2 to 120. Feed range is from 0.0015" to 0.091" per revolution. Hendey Machine Div'n, Barber Colman Co., Rockford, Ill., or — **Circle Inform-A-Gram No. A57.**

ANOTHER LODDING





Lodding Double-Acting Retracting Clamp — clamps in two directions simultaneously. Comes in 4 sizes each of 3 types — hand knob, nut and hand cam.

Now ready for you at your nearest Lodding distributor

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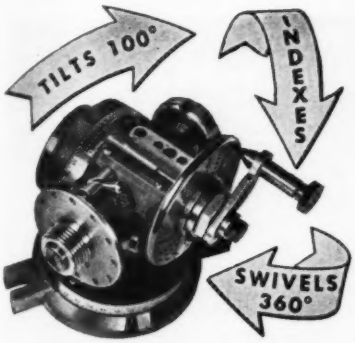
CIRCLE INFORM-A-GRAM KEY NO. 192



FOR FASTER PRODUCTION

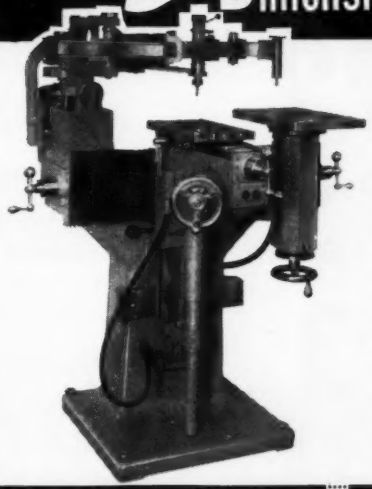
THE ELLIS DIVIDING HEAD

Although it is built to fine instrument standards, the ELLIS is a really *rugged* tool room or production tool that's designed for unusual versatility. Its universal motions — swiveling in two planes — will save time and increase profits and accuracy on your millers, grinders, drill presses and jig borers. It has 6½" swing, or 11" swing when used with riser blocks. Work may be held between centers, or in chucks or collets. To save rehandling of work, and to save money, investigate the ELLIS by writing for complete details!

NICHOLS MORRIS CORPORATION
76-X MAMARONECK AVE.
WHITE PLAINS, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1931

3-Dimensional panto-miller

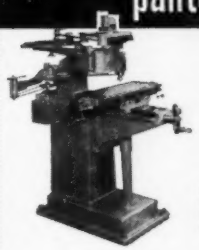


For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:
Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard and special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller



Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:
Engraves
Profiles
Die Cuts
Mills

Special Model 2B with 60" tracer arm available for low cost production of metal stamping dies.

Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin 173.

WITH RIGHT ANGLE ADAPTOR

WITH FACE PLATE

AVAILABLE SIZES 7", 10", 14", 18", 24"

EST. J&B 1870

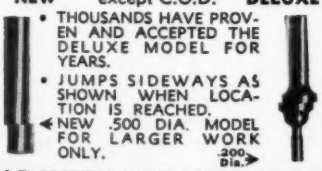
JOHNSON & BASSETT, INC.
PRODUCTION TOOL DIVISION
WORCESTER, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1933

.0003 HOLE LOCATION IN 1 MINUTE

EDGE FINDERS

$2.50 NEW — POSTPAID except C.O.D. — $10.00 DELUXE



- THOUSANDS HAVE PROVEN AND ACCEPTED THE DELUXE MODEL FOR YEARS.
- JUMPS SIDEWAYS AS SHOWN WHEN LOCATION IS REACHED.

◄ NEW .500 DIA. MODEL FOR LARGER WORK ONLY. .200 Dia.►

ADJUSTABLE VISE STOP

$2.95

HUNDREDS OF PIECES TO A .0003 TOLERANCE WITH THIS HARDENED VISE STOP THAT IS ADJUSTABLE IN ALL DIRECTIONS. ATTACH TO VISE WITH ONE ¼—20 TAPED HOLE.

Dealer Inquiries Invited

GLOVER MFG. CO.
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economically priced press room equipment

DURANT Stock Straightener

Plain and Motor Driven STRAIGHTENERS. Made in 18 models.

Manufacturers of Stock Reels, Roll Feeds, Straighteners, Scrap Choppers, Die Pullers, Foot Presses, Coil Cradles, Press Guards, Stock Oilers.

WRITE FOR NEW FREE CATALOG

DURANT Tool Supply Co.
PROVIDENCE 3, RHODE ISLAND

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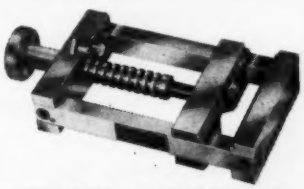
ESSENTIAL



PRODUCTO TOOLROOM VISE

Producto's Precision Toolroom Vise is essential equipment for your jig borers, surface grinders, drill presses, tappers. It's extremely strong, yet weighs only 13 lbs. and has a 2" high frame. Has large jaw opening, will clamp heavy as well as light workpieces. All surfaces hardened and ground. Works on five surfaces. Write for Bulletin TE2-103.

THE PRODUCTO MACHINE CO.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1935

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1,092

GAGES and Precision CUTTING Tools

in LESS than **3** SQ. FT.

OF FLOOR SPACE!

YES, as many as 1,092 of your valuable tools and gages can be safely and systematically stored in one M & S GAGE STORAGE FILE . . . each tool in its individual compartment . . . adjustable dividers adapt for gages, taps, dies, reamers, form tools, etc.

Saves Space! Time! Costly Damage!

Reinforced construction for lasting service.
3 models to meet your requirements.

Enthusiastic users include General and Specialty Machine Shops, Aircraft, Electronic, and Automotive Industries.

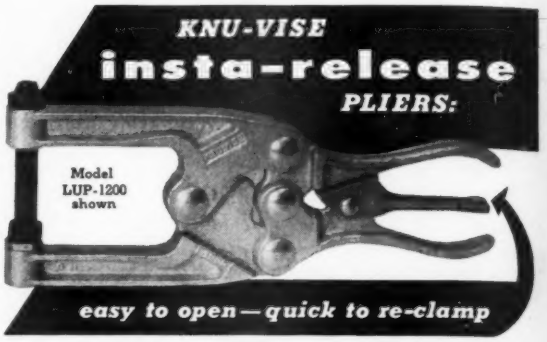
Write, Wire, Phone for Specs and Prices!

M & S EQUIPMENT CO., Inc.

380 Darwin Drive • Snyder 26, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1941

KNU-VISE
insta-release
PLIERS:



easy to open—quick to re-clamp

insta-release —that's the name for the easy-action release-lever Knu-Vise pliers. Pliers open instantly re-clamp quickly—easily—without waste motion.

Maintains control over the free-swinging handle—permitting re-clamping with the same grip. Always remains within the hand span of the user.

Flip it over and you have instant release in the other direction. The Knu-Vise *insta-release* lever is available on P-1200 and P-1800 Series pliers.

Remember: Every model of the more than 150 *Knu-Vise* clamps is quick to lock—and quick to open. Ask for a demonstration.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS — LAPEER MANUFACTURING CO.

3064 DAVISON ROAD • LAPEER, MICHIGAN

WESTERN DIVISION: 419 Magnolia, Glendale, California

CANADIAN DIVISION: Higginson Equipment Sales, Ltd., Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1942

Direct-Air VALVES

for Easy AUTOMATION

COMPLETE VALVE CATALOG Ready!

MEADMATIC

4-way pilot-operated air valve for direct or remote control—no delicate electrical hookup needed.

A light momentary touch on limit switch actuates main valve piston—response is instantaneous! Catalog free.

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MEAD SPECIALTIES COMPANY

4114 N. Knox Ave., Dept. HA-117, Chicago 41, Ill.

PATHFINDER IN AIR POWER AUTOMATION

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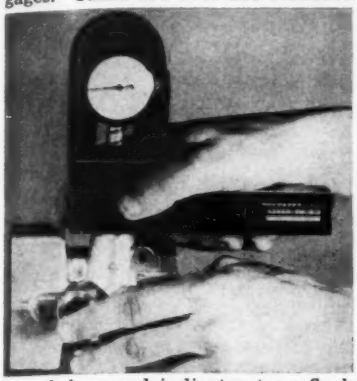
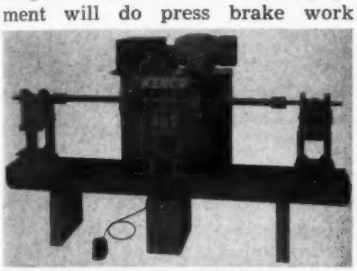
Designed in size and style to meet 90% of all depth gaging problems are the Standard selfmastering indicator gages. There are over 150 standard



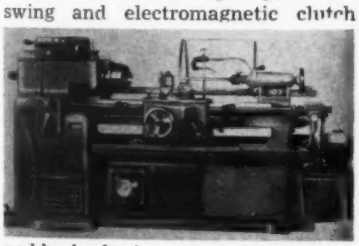
barrel, bar, and indicator type flush pin gages now available from stock. The Union Gage Corp., 711 Lehigh Ave., Union, N. J., or —
Circle Inform-A-Gram No. A58.

Exceptionally Long progressive die work can be done with the triple punch press. It will also do punching, forming, and blanking where long die sets are used. This equipment will do press brake work



normally requiring brakes costing more and does the work more quickly. The presses set on 42" centers, allowing a total die area of 8" x 102". Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles, or —
Circle Inform-A-Gram No. A59.

A Fast Cutting Lathe for long or short, internal or external work is the Man-Au-Cycle Hydro-Magnetic. Features include 32" threaded length, 0.0250" to 2.00" lead capacity, 13" dia swing and electromagnetic clutch



and brake for instantaneous stop and start. Attachments include sine bar type, taper attachment, and tracing attachment. Man-Au-Cycle Corp. of America, 132 - 53rd St., Brooklyn, N. Y., or —
Circle Inform-A-Gram No. A60.

An Inspection Bench carries necessary gage blocks and accessories for checking the various type gages in use rather than removing gages from the job to the laboratory for inspection. The unit can easily be moved to the desired location and a heavy-duty foot brake locks it to the floor. The work area is 24" x 28" and the unit features file drawer, compartment area, gage drawer, retractable folding seat, and pull-out writing desk. Wright Tool Co., 4316 N. Woodward Ave., Royal Oak, Mich., or —
Circle Inform-A-Gram No. A61.

How do you judge power chuck values?

By *Accuracy?*

.001" is *guaranteed* with this chuck — on new runs and re-runs, *without re-truing jaws.*

By *Pieces Per Day?*

You can make drastic cuts in down-time with the Buck. Top jaws can be machined in the tool room — hardened — and fitted *in minutes.* Final accuracy adjustment is made under actual operating conditions *with full air pressure.*

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Hardened key ways greatly prolong production service. The Ajust-Tru principle helps compensate for wear.

By *Price?*

You get all these extra Buck features *at conventional power chuck prices.*

Buck AJUST-TRU® **POWER CHUCK**

Hardened Key Ways Standard Feature

A Buck *plus* at no extra cost. Combined with hardened top jaws (made practical by the Buck for all operations) you can run thousands more pieces than with conventional chucks. Chuck sizes are: 6½", 8¼", 10", 12" — made with 2 or 3 jaws.

The patented Buck Ajust-Tru principle makes such unusual performance possible. Write for full details today. *You can't beat chucking with a Buck.*

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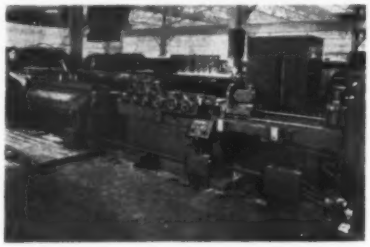
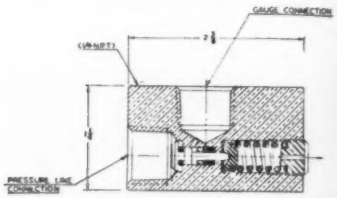
CIRCLE INFORM-A-GRAM KEY NO. 195

Non-Ferrous Tubing in a ¼" to 1" OD range can be finish-drawn, straightened, cut to length, and recoiled directly from long coils of stock at a high production rate with the Lomatic tube processing line. The line is composed of an uncoiler, drawbench, roller straightener, flying cut-off, automatic discharge conveyor, and recoiler. Advantages include only one operator needed, reduced floor space, and ease of packaging. Loma Machine Mfg. Co., Inc., 114 E. 32nd St., New York 16, or — **Circle Inform-A-Gram No. A62.**

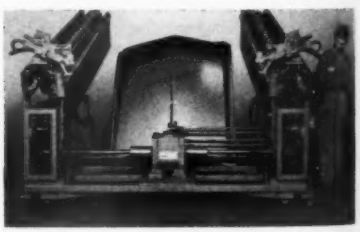


Punching and Embossing operations formerly requiring several presses can now be done with a five-station open gap horn press. One compact welded steel frame houses five main cylinder and ram assemblies which are controlled individually by foot pedals. Specifications include 100-ton capacity of each main ram, 100 to 4 tons range for each ram, and 6" stroke. The Hydraulic Press Mfg. Co., A Div'n of Koehring Co., Mt. Gilead, O., or — **Circle Inform-A-Gram No. A63.**

Limit Maximum Pressure on air or oil gages with an adjustable gage protector. When installed in a gage line, the protector automatically cuts off flow to the gage whenever system pressure exceeds the spring setting of the device. Basic design makes use of a spring loaded poppet type valve. The spring is manually adjustable for settings for any desired closing from 50 to 300 psi or from 500 to 5000 psi. Superior Hydraulics Div'n, Superior Pipe Specialties Co., 15201 St. Clair Ave., Cleveland 10, or — **Circle Inform-A-Gram No. A64.**



Handle extra large stampings with a standard dual jaw automatic unloader. Two standard mechanical jaw assemblies are mounted on the carriages at a 45° angle so that they automatically clear the stamping when it is unloaded from the press. The unloader unit is flexible and can be adjusted to unload a wide variety of large parts. Press Automation Systems, Inc., 25418 Ryan Rd., Centerline, Mich., or — **Circle Inform-A-Gram No. A65.**

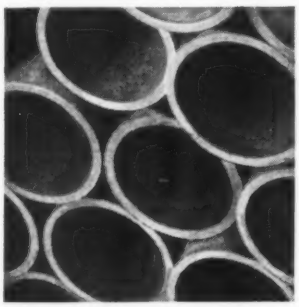


Allison
Abrasive Cutting Wheels

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

BETTER TUBING CUT-OFFS UP TO 14" DIAMETER



Pictured here is a close-up of part of a production run of tubing cut with an Allison Abrasive Cutting Wheel

NOTE—

- **Smooth, Burn-Free Cuts**
- **Absolute Minimum Burr**
- **No Distortion of Tubing**

• The fastest, lowest-cost, highest-quality cut-offs of almost any tubing material, *in sizes up to 14" diameter*, can be obtained by abrasive cutting...with absolute minimum of burr.

But such performance on your individual tube-cutting job is dependent on your use of the particular type and grade of abrasive wheel that provides the best balance for such inevitable variables as...available equipment...material to be cut ...cutting speed...desired quality of cut...and finally, wheel life.

The full line of Allison Wheels ...rubber or resinoid bonded for wet or dry cut...includes many wheels that are especially designed for Tube Cutting Service.

Allison Field Men...all of them Abrasive Cutting Specialists...have the specialized Know-How, and the wheels, to help you arrive at the best answers to your specific problems. Please ask for their help, without obligation.

Abrasive Cut-Off is the Ideal Method for tubing...tool rooms...job shops...high temperature alloys and tough titanium...heat-sensitive metals...solids up to 12" billets and many other jobs.

***For more complete information** write for this helpful booklet—*
ABRASIVE CUTTING BY ALLISON

ACCO

ALLISON DIVISION • American Chain & Cable

254-T Island Brook Avenue, Bridgeport 8, Conn.

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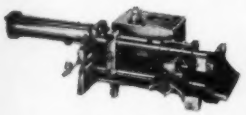
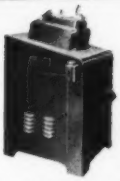
BOOST POWER PRESS PRODUCTION!

These Components Reduce Material Handling Costs, Save Floor Space and Permit Continuous Flow Operation.



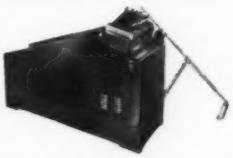
AIR OPERATED SLIDE FEEDS

MECHANICAL SLIDE FEEDS

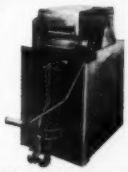


SMALL PARTS STRAIGHTENERS

SCRAP CHOPPERS



STOCK CRADLE AND STRAIGHTENERS



PORTABLE STOCK STRAIGHTENERS

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600 HONEYSPOT ROAD • STRATFORD, CONN.

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- ✓4" DIA. STAGE OPENING
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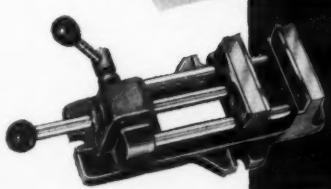

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Heavy 4" wide removable jaw inserts allow simple, quick adaptation for low cost jigs and fixtures. 5½" opening. Easy hand pressure on hardened and micro-ground bar locks and holds the work fast.

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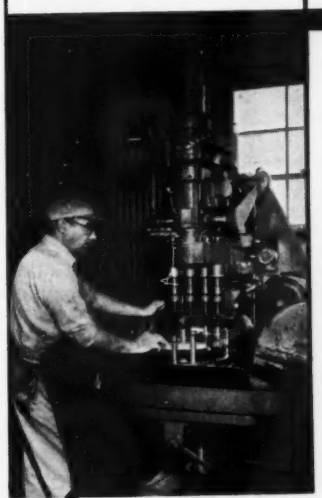
Thompson Products Inc. | *West Coast Division*



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Fourth edition. 368 pages, 26 chapters, and over 400 illustrations, drawings, charts and graphs. Extensively revised and enlarged plus a special section of 165 Practical Points in Die Design and Construction. Completely indexed.
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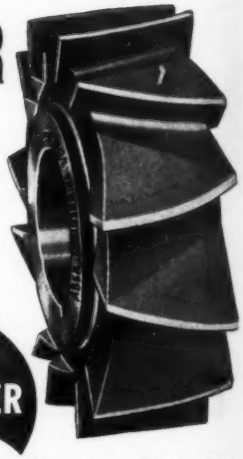

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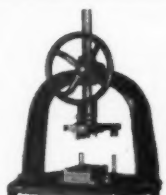

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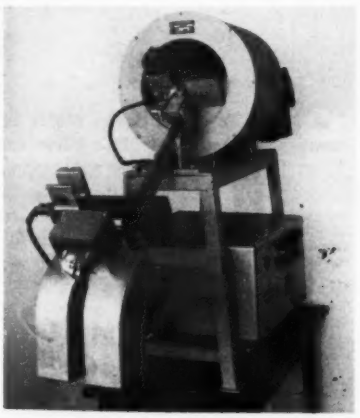
CIRCLE INFORM-A-GRAM KEY NO. 1982

An Adjustable Length Stroke can be applied in any desired direction around a full circle in a vertical plane with the hydraulically operated joggler. Maximum stroke length is ½" and load capacity is 18,000 lbs. Manual electric pushbutton controls

actuate all machine functions. Ram direction is adjusted manually by a crank and direction of the stroke is indicated on a dial linked with the ram rotating mechanism. The Hufford Corp., 1700 E. Grand Ave., El Segundo, Calif., or —
Circle Inform-A-Gram No. A66.

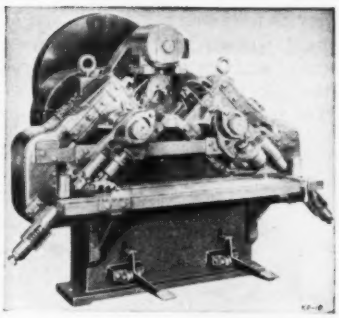
Package a Large Variety of Parts such as nuts, bolts, screws, rivets, dowels, etc., with a bench model electronic hoppermatic. It can be changed over from one size or shape to another in a short time. Any



count from 1 to 1,000 can be obtained by merely setting the dials on the predetermined electronic counter. An extra large funnel housing can accommodate screws up to 3" in length. U. S. Engineering Co., 40-21 22nd St., Long Island City, N. Y., or —
Circle Inform-A-Gram No. A67.

BUY U. S. SAVINGS BONDS

The Kling Double Angle Shears feature the multiple performance possible with two cutting sides in the shearing of structural angles, bars, rounds, and flats. Other features include independent clutch operation for each cutting side, and interchangeable wear strips in the main frame. All sizes of these shears can be furnished with special attachments to meet specific requirements. Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago 51, or —
Circle Inform-A-Gram No. A68.



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END MILLS

There is a difference in end mills . . . MELIN end mills! Proof of this is evident in the continued increase in MELIN popularity. The growth in MELIN tool acceptance was by no means an accident . . . The secret is in *CONSISTENT QUALITY*. This standard of Quality assures you better performance . . . longer lasting performance . . . CONTINUOUSLY . . . from one shipment to another. Next time you order end mills . . . specify the finest . . . specify MELIN.

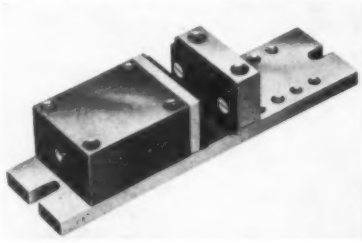
MANUFACTURED IN TWO, THREE AND FOUR FLUTE TYPES.

Representatives in principal cities.

MELIN TOOL COMPANY, INC.
3371 West 140th Street
Cleveland 11, Ohio

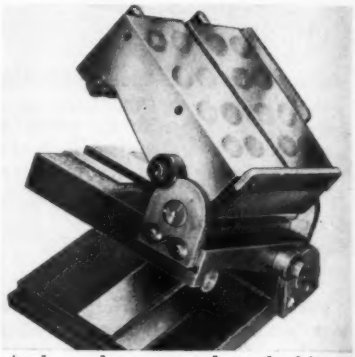
CIRCLE INFORM-A-GRAM KEY NO. 199

A Lightweight, compact, holding device for assembly, bench, and other light work where fast action, economy, and versatility is required is the air vise of the Toolmore line. The unit has a maximum opening of 2½" which is adjustable at ½" increments for precise and fast work operations. The vise mounts can be removed from the base and used in any size of work arrangement or shape. All sides are square and parallel to supply alignment of the unit in any set-up. Burklyn Co., 3429 Glendale Blvd., Los Angeles 39, or—**Circle Inform-A-Gram No. A69.**

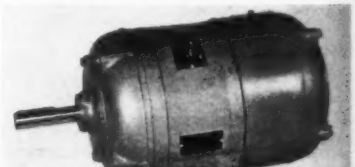


A Versatile Relief grinding attachment is said to perform 90% of all grinding jobs confronting shop operators and tool grinding departments. This fixture is made to quickly sharpen such basic tools as taps, countersinks, and step-drills because of its simple infinitely adjustable cam with constant rise and its rapid change to different numbers of flutes, right or left hand. Steptool Grinding & Mfg. Co., 3613 E. Olympic Blvd., Los Angeles 23, or —
Circle Inform-A-Gram No. A70.

Use Dual Field Permanent magnetic chucks that allow each side to be magnetized or demagnetized independently are now available on single and compound angle hinged sine plates. This feature allows the use of a surface gage on one side without disturbing the workpiece chucked on the other side. Bald Eagle Corp., Dept. TP, 356 Cedar St., St. Paul 1, Minn., or —
Circle Inform-A-Gram No. A71.



A New Cle-Matic Brake Motor has been announced by The Cleveland Electric Motor Co. It is a polyphase motor with the built-in mechanical brake and is designed for quick releasing and fast braking. With this feature solenoids and coils are eliminated. The magnetic field of the Stator releases the brake when cursent is turned off. Braking torques are easily adjusted from the outside with a screw driver. The Cleveland Electric Motor Co., 5213 Chester Ave., Cleveland 3, or —
Circle Inform-A-Gram No. A72.



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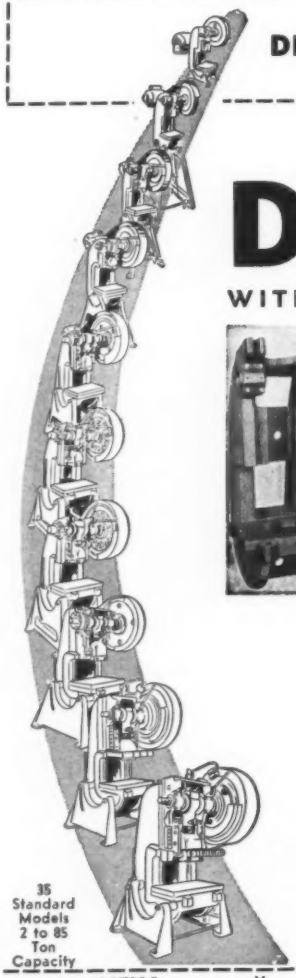
WITH PRESS-RITE POWER PRESSES

Rugged reinforced high tensile semi-steel frame with full V adjustable gibs keeps dies correctly aligned assuring accuracy and longer die life. Built-in steel tie rods on all capacities 45 ton and larger.



35 Standard Models 2 to 85 Ton Capacity

Why risk the life of your expensive dies? When you put your dies in a PRESS-RITE Punch Press, you will have complete confidence that you will get more pieces per die, greater accuracy and less die maintenance. Discover the differences in PRESS-RITE design. Let us show you how to get longer runs before grinding dies. Ask your PRESS-RITE distributor or write:

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used by more . . . for more production.

NEW FREE CATALOG

Write for New Press-Rite catalog No. 855 with illustrations, specifications and "Money Making" facts of all models, 2 to 85 ton capacity.

PRESS-RITE

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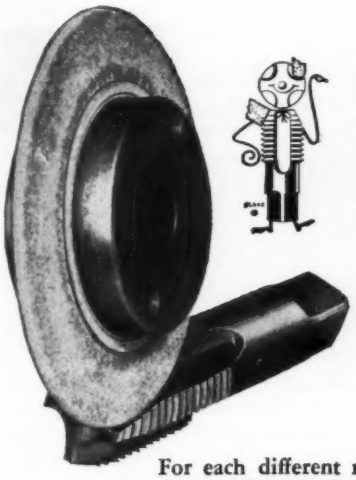

For Profitable Tapping, Grind Your OWN Best Rake Angles!

Controlled grinding of tap flutes and chamfers.

For each different material, there is a "best" rake or hook angle for tapping. You can grind and re-grind this angle on taps for each of your jobs . . . positively and accurately, time after time . . . with the BLAKE Flute Grinder.*

Combined with the BLAKE Chamfer Grinder, this machine can give you substantial savings even with Class 3 or 4 fit standards, because you will have:

1. Best rake or hook angle for the material tapped.
2. Exact indexing of cutting edges.
3. Correct spiral points.
4. Accurately relieved chamfers.

The increased uniformity and accuracy of your threads, plus *far* greater tap life, are the sound basis for maximum savings in your tapping costs.

Ask us for the details of what this combination can do for you.

**Now available with air operated vertical slide.*

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Precision adjustment like surface gage
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Powerful 50 lb. pull base

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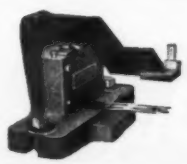

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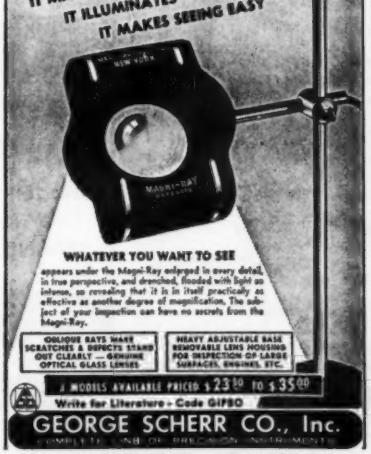
SCHERR MAGNI-RAY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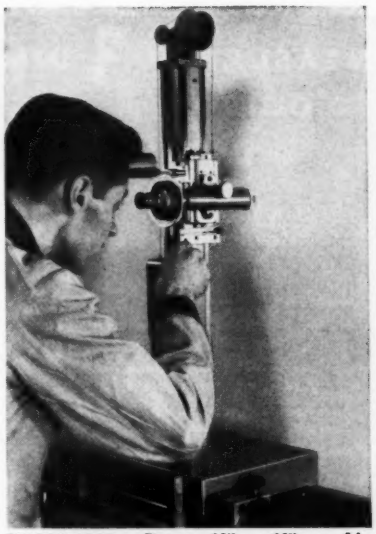

M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

with new Gaertner Coordinate Cathetometers

These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.

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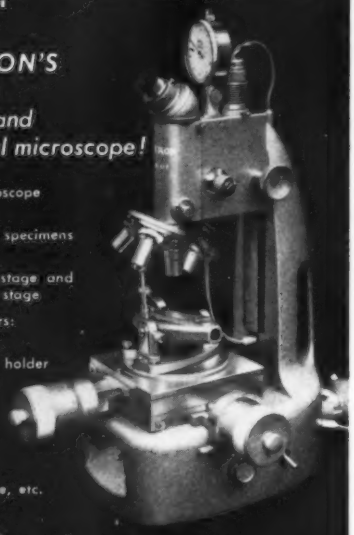
CIRCLE INFORM-A-GRAM KEY NO. 2015

MEASURE IN 3 DIMENSIONS TO 0.0001"

with UNITRON'S Combination Toolmakers and Metallurgical microscope!



- Direct reading from microscope screws and dial indicator
- Examines polished metal specimens at 30X, 100X, 400X, etc.
- Ball bearing rectangular stage and calibrated circular rotary stage
- Three separate illuminators: substage, surface, vertical
- Inclinable work and tool holder
- Accessories include viewing screen for contour projection and optical comparison, eyepiece scales for measuring screw threads, diameters, metal grain size, etc.

Even the smallest shop can rapidly pay for this versatile instrument in time and materials saved. UNITRON Model TM, with all its features, costs about the same as the lowest priced, simple shop microscope. ..... fob Boston only **$1050**

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Delivers 0 to 13,000 Controllable Blows Per Minute

Weighs only 20 oz. Measures Just 6" Long.

Bantam Bully Air Hammer has Superior's exclusive metering trigger—delivers anywhere from 0 to 13,000 completely controllable blows per minute. Uses only 6.5 cu. feet of air per minute at 90 P.S.I.

24 DIFFERENT TOOLS FOR

- Scaling
- Chiseling
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- Tamping
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- Caulking
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NEW HANDY SLIP CHUCK

Tools are positively locked, snap in or out easily, can be locked in 8 different positions.

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Cut out Floor Drilling, Bolts & Lag Screws

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Saves up to 30% on cost, 80% on time, checks up to 85% of transmitted vibration at its source! Easy to move, too, whenever you have to shift a production line. Unisorb is impervious to oils and cleaning solutions. Permanent alignment, no machine "walking," precision shimming.

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FE 7-5

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THINK of it!

NOW you can have a boring head that will **BORE, FACE, TURN** and **GROOVE** at no higher cost than you would pay for an ordinary, single purpose boring head.

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A Boring Head That Won't Face is NOT Complete

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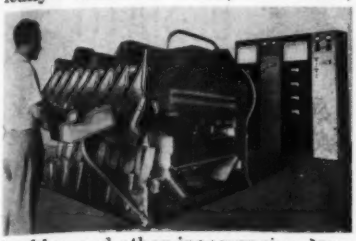
Model "D"

Chandler-Duplex
COMBINED BORING AND FACING TOOLHEADS

CIRCLE INFORM-A-GRAM KEY NO. 2024

A Hot Forming and sizing press is used for automatic straightening and finish forming of titanium and stainless steel parts. This press automatically removes cans, wrinkles,



buckles, and other inaccuracies. Man hours are saved, unit production is increased, and reductions in tooling costs can be obtained with this unit. T.W. & C.B. Sheridan Co., 24701 Crenshaw Blvd., Torrance, Calif., or **Circle Inform-A-Gram No. A73.**

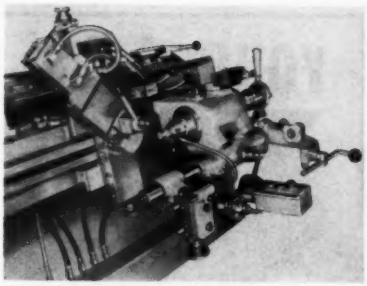
The Delta Hemmer eliminates the present problems encountered in hemming multi-contoured doors, requires little floor space, makes high-bay areas available, and reduces

down time. This hemmer can be modified to hem practically any shape, which makes it adaptable to all fields of production. Delta Welder Corp., 8525 Livernois, Detroit 4, or—**Circle Inform-A-Gram No. A74.**

More Accurate Measurement and broader applications are two improvements in the Model C Kwik-Check precision hole gage. Small hole diameters with countersinks are measured. It compensates for a

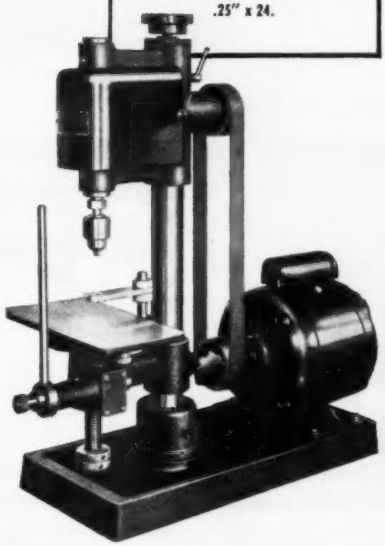
countersink by measuring the hole diameter at the base of the countersink. Accuracy is 0.0005". There is also a Kwik-Check Kit C which provides interchangeable countersink heads for all models of the gage. Allied Products Div'n, Hamilton Watch Co., Lancaster, Pa., or — **Circle Inform-A-Gram No. A75.**

Designed and Built to Duplicate countless workpieces from either flat or round templates is the improved tracer lathe. Parts are duplicated with accuracy as close as 0.0003" or less, and the unit is provided with push button starting and stopping of automatic cycle. Motor direction and speed are controlled by the spindle drive control levers mounted by the headstock control. A lever mounted on the pedestal provides any speed from 120 to 2900 rpm spindle. Elgin Tool Works Inc., 1770 Berteau Ave., Chicago 13, or — **Circle Inform-A-Gram No. A76.**



Now *Precision* TAPPING OF THIN AND BRITTLE MATERIALS

Hamilton Super Sensitive, Small-Hole, Precision Tapping Machine.
Capacity — .034" x 120 to .25" x 24.



Recent design change provides a simple homing device as a standard component of the

HAMILTON SUPER SENSITIVE, SMALL-HOLE PRECISION TAPPING MACHINE

and makes routine of such problem work as the tapping of precision holes in thin metal sheets or in brittle plastics. Even improves performance in the tapping of blind holes!

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will want full information about this important development!

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CIRCLE INFORM-A-GRAM KEY NO. 203

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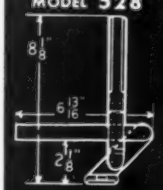
8 new HUSKIES...
DE-STA-CO

designed for such rugged chores as body-bucks!...

and featuring . . . uniquely-designed forged alloy steel base . . . replaceable components . . . hardened bushings and pivot rods and ¾" square cold-drawn bars and handles. HOLDING PRESSURE—1650 lbs.!

Available in two series . . . 528 (with vertical handle and horizontal bar, when closed) . . . 527 (with low-silhouette handle and holding-bar) . . . Each series is available with front, side or bottom mounting bases.

MODEL 528



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WORLD'S FIRST LINE OF TOGGLE CLAMPS
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The **HEIMANN** *MAGNETIC* **CHIP REMOVER**

THIS HAND IS IN THE CHIPS! Yes, and the chips are *not* in your eyes or hair or ways of machines. The Heimann Magnetic Chip Remover gets chips out of blind holes rapidly, cleanly, safely. It's a lastingly efficient permanent magnet in a knurled aluminum holder. Send it in after chips and it comes out covered with them.

YOU CAN'T AFFORD to be without it! A natural for your tool box or crib. Made ⅛" to ½" sizes, at a price to attract. Write now for circular.

Permanent — Easier
Strong — Convenient
Quicker — Better

HEIMANN MFG. CO., URBANA, OHIO

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SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

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PRODUCTION TIME AND LABOR SAVERS

TAP EXTRACTORS
Remove broken taps; no drilling; no delays; no damaged threads. Production range of sizes.

"Multi-Position" TOOL HOLDERS
Head adjustable to eight positions, including straight, right or left offset.

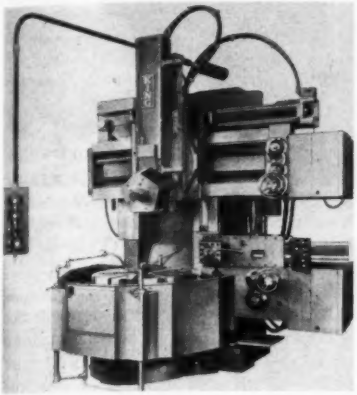
TAP EXTENSIONS
In sets of two 5" extensions; fit standard taps (4, 3, 2 flute) from #10-(3/16") to 1"

PIPE, STUD AND SCREW EXTRACTORS
Hardened steel makes strong, four-point, pulling grip.

Write us for DATA FOLDER #38 giving prices and specifications, and describing how these time and labor saving tools will help reduce costs in your shop.

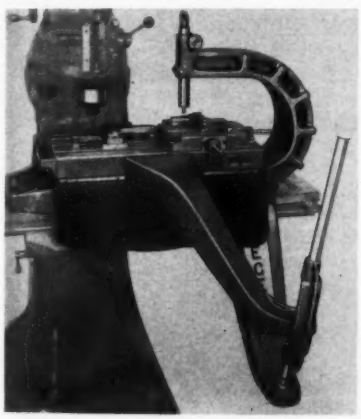
The WALTON Company
HARTFORD 10, CONN.

A 36" King Vertical Boring and Turning Machine with full electrical control is equipped with automatic feed stops. Adjustable stops are provided for vertical and horizontal feed



control of all heads. For standard 5-position turret head, one vertical adjustable stop is provided for each of the 5 turret faces. American Steel Foundries, King Machine Tool Div'n 1150 Tennessee Ave., Cincinnati 29, or—**Circle Inform-A-Gram No. A77.**

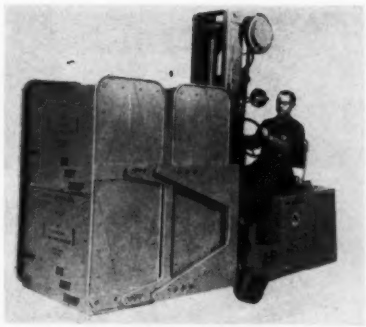
A Duplicator permits fast, easy, and exact 2 dimensional contour profiling on any vertical miller. Model R-200 mounts on any table by tightening only 4 bolts. It is equipped with adjustable built-in friction



brake for top-capacity profiling jobs. Free-moving table is float-mounted on precision ball-bearings in circular ball-bearing raceways. Capacity is 6" x 6". J. M. Kalins Co., 1575 Railroad Ave., Bridgeport, Conn. ,or — **Circle Inform-A-Gram No. A78.**

YOUR INFORM-A-GRAM CARD FOLLOWS PAGE 166 IN THIS ISSUE.

Handling fragile loads without the aid of pallets is possible with electrically-powered fork lift trucks. Using a cascade clamp, side-shifter and manual pressure relief valve, any fork lift can transport and high stack any type of products. Loads of widths ranging from 20½" to 70" can be handled with the clamp. The clamping arms are 48" long, 60" high and are lined with 1" sponge rubber for protection of the loads. Lewis-Shepard Products, Inc., 125 Walnut St., Watertown 72, Mass., or — **Circle Inform-A-Gram No. A79.**



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Unobstructed perimeter (work from any side!)

Six Wheel Models

Capacities to 5,000 pounds.

LIFT LOWER TRANSPORT with PORTELVATOR®

The Handy HAMILTON Portable, Elevating Table

3 table surfaces 4 point support

Four Wheel Models

Special Designs tool

More Service for Less Money than Any other unit of equipment

A portable, height adjustable, steel table-truck-work bench! Used for die transfer, machine feeding, assembly (at *best* height, in *best* light). For lifting, lowering, transport of all compact, heavy loads. Saves "handling" accidents to both men and materials. Saves minutes for men wherever used.

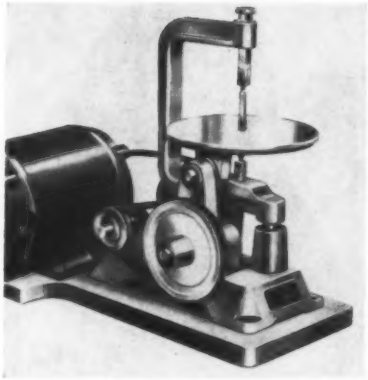
Write* for NEW, FREE Bulletin No. P-2408

* ADDRESS

THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE
2408

CIRCLE INFORM-A-GRAM KEY NO. 205



File and Saw Small Dies, jigs and templets with the bench type die filer. Featuring a tilting table, the unit uses standard 3½" or 4" parallel machine files as small as 3/64" dia. Positive accuracy in operation is assured by a rigid mounting design in the yoke holding the files. High Speed Hammer Co., Rochester, N. Y., or—**Circle Inform-A-Gram No. A80.**

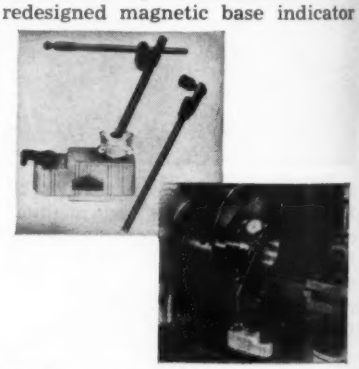
Weld Studs faster and more reliably with a small stud welding gun, weighing ⅛ less than other units. The Nelson NS-10 will weld all studs up through ½" in dia. The gun weighs less than 4 lbs and measures

only 9" long. It increases stud welding productivity, decreases operator fatigue, and is easy to maintain. Nelson Stud Welding Div'n, Gregory Industries, Inc., Lorain, O., or — **Circle Inform-A-Gram No. A81.**

Automatic pushbutton operations with frictional drive work retainer rings are combined in a lapping machine. With a 24" dia anti-distortion

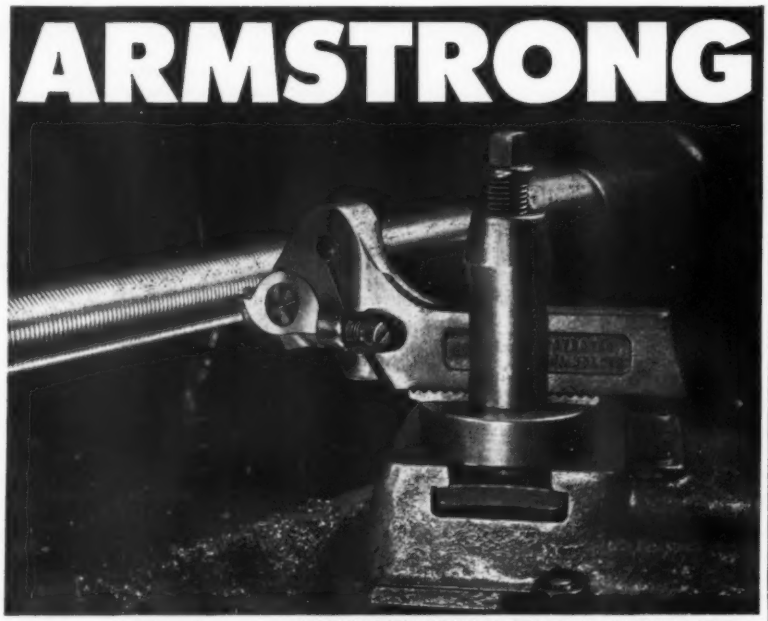
lapping plate, the Gyro-Matic handles all types of flat parts. It will handle workpieces of 9¾" dia. Spitfire Tool and Machine Co., 2931 N. Pulaski Rd., Chicago 41, or — **Circle Inform-A-Gram No. A82.**

A Lever Operated Cam to facilitate removal or relocation of the indicator holder base, the magnets of which exert a 125 lb pull, is a feature of the redesigned magnetic base indicator



holders. Another improvement is the use of a spoked adjusting nut to replace the round knurled nut which locks the stem in position. Enco Mfg. Co., 4520 W. Fullerton Ave., Chicago 39, or — **Circle Inform-A-Gram No. A83.**

ARMSTRONG



Each year ARMSTRONG TOOL HOLDERS become more important to you

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ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Saves: All Forging, 70% Grinding, 90% High Speed Steel."

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ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market... are used by over 96% of the machine shops and tool rooms... are carried in stock for your convenience by all industrial distributors of consequence.

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★ **DEBURRING**
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for machine deburring and chamfering of line-drilled and otherwise inaccessible hole surfaces.

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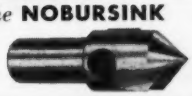
for rapid deburring and chamfering openly accessible hole faces.

the **NOBURSINK**



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6360 Farmdale Ave., No. Hollywood, California

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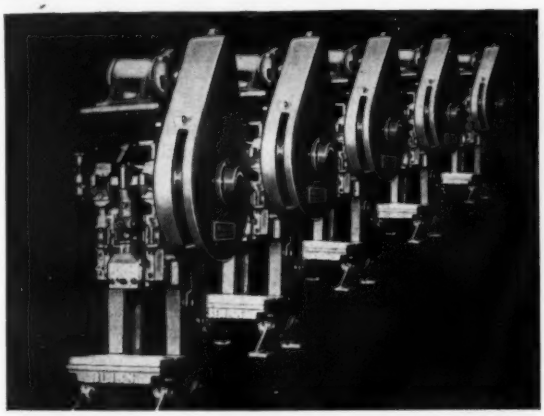

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- Split bronze bushings in frame and connection bearings
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- Extra long "V" type removable gibs
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BLISS SINCE 1857

100 years of making metal work for mankind
E. W. BLISS COMPANY
Canton, Ohio

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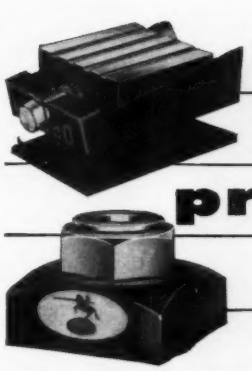

How to keep **precision** *in a precision machine*

SET YOUR MACHINES LEVEL AND KEEP THEM LEVEL WITH EMPCO LEVELING JACKS

You're paying for precision. *But . . . are you getting it?* Improper leveling and excessive vibration can seriously impair the precision performance you pay for in costly machine tools. *Set* your machines level and *keep* them level with EMPCO Leveling Jacks! EMPCO Jacks provide a solid, smoothly adjustable foundation for machine tools, large surface plates, automation lines, tool room and production equipment of all types. Easily installed, they increase machine efficiency, reduce downtime and maintenance. Periodic releveling is a quick, easy one-man job. Combined with VI-SORB Mounting Pads, EMPCO Jacks control internal and transmitted vibrations, reduce noise and retard machine creepage. Jacks available in six styles, 25 models. Pads cut to fit.

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EMPCO LEVELING JACKS

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You can't go wrong

in buying Granite Surface Plates

if you follow these rules . . .

1. Be sure that surface plates are TRUE QUARTZ GRANITE, which is unequalled for surface plate performance. (In some cases, black diabase is being classified as "granite").
2. Look for *clearly defined accuracy.* Get a full explanation as to maker's method of expressing flatness.
3. Investigate for *wear resistance* properties.
4. Don't be misled by claims pertaining to such irrelevant factors as "high compressive strength". (The truth is that all granites possess far more compressive strength than is ever needed for surface plate use).
5. As in everything else, be guided by the reputation of the manufacturer.

We invite you to apply this check-list against Bryant Rock-of-Ages "TRUE" Granite Surface Plates. You'll find that these surface plates are the finest in every respect. This is because Bryant Rock-of-Ages Surface Plates, made of premium granite from the world's largest quarries, are finished *on the head of the grain;* and because their accuracy and satisfactory performance are guaranteed by two of the leading names in American industry. Write today for free folder.

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DIVISION OF BRYANT CHUCKING GRINDER CO.
Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers

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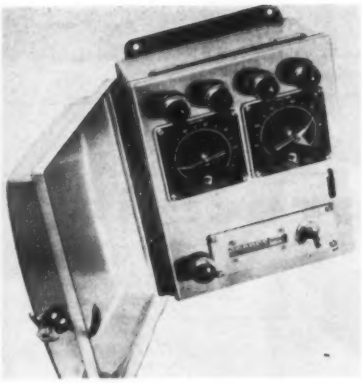
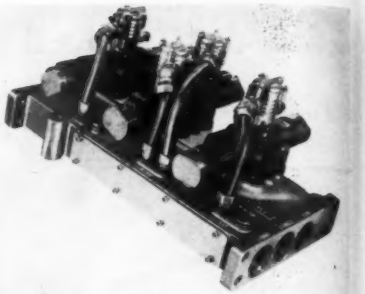


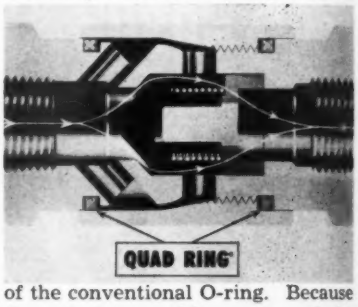
Toolitrol counter units were designed for installation as an accessory on single or multiple spindle machines. They permit cost reductions by controlling tool-change periods and extending tool life. Sizes of these units range from 6" x 8" x 5" for the single counter to 16" x 14" x 7½" for the six unit counter. Scully-Jones & Co., 1901 S. Rockwell St., Chicago 8, or —
Circle Inform-A-Gram No. A84.

A High Capacity, multiple station manifold is designed to provide compact, economical group mounting of the basic ¾" type Speed King 2, 3,



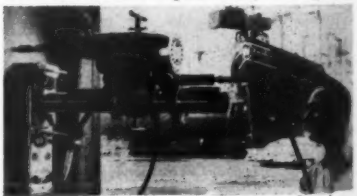
and 4-way pilot operated control valves. Adaptable to any type of control valve application, the manifold permits mounting of any combination of single or double solenoid Speed King valves at any desired location on the manifold. For further information write to Valvair Corp., 454 Morgan Ave., Akron 11, O., or —
Circle Inform-A-Gram No. A85.

Cost Reduction, improved design, and reliable performances are some of the advantages of Quad-Rings. This seal, with its quadrilateral cross section, has four lips to increase the efficiency of the two sealing surfaces



of the conventional O-ring. Because there is less working action of the Quad-Ring gasket in the grooves, tolerances for groove dimensions and finishes are reduced. Minnesota Rubber & Gasket Co., 3628 Woodale Ave., Minneapolis 16, or —
Circle Inform-A-Gram No. A86.

Heavy Industrial Drilling can be done with the 1¼" magnetic drill press which is tolerance built to drill holes within 1/64" accuracy. Designed for continuous operation, the press



features a drill point locator for immediate, exact positioning, two-piece construction for ease of handling, and remote control hydraulic power feed. Length of the drill stroke is 15". The Black & Decker Mfg. Co., Towson 4, Md., or —
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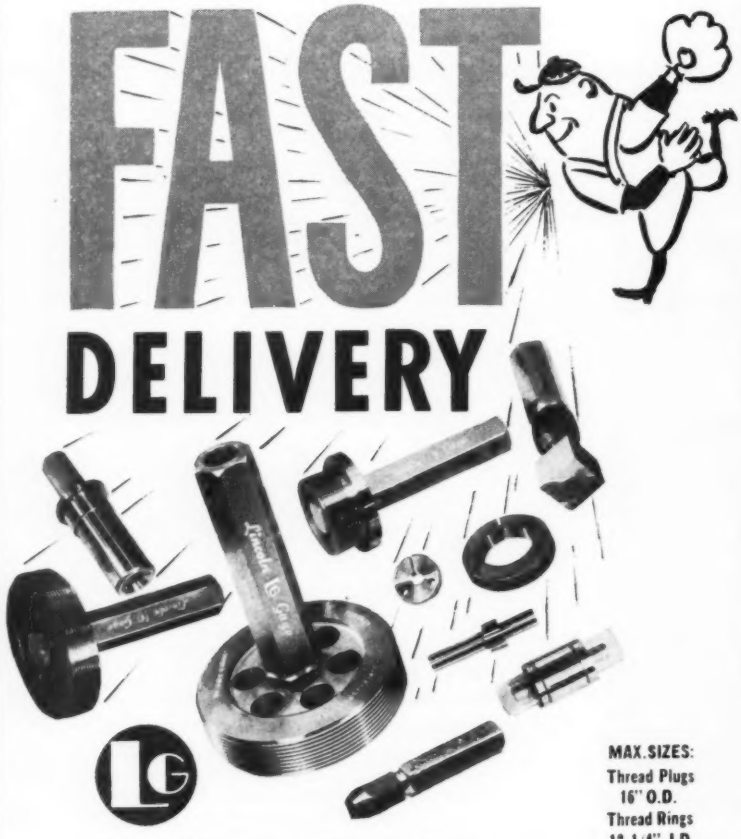

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Thread Rings
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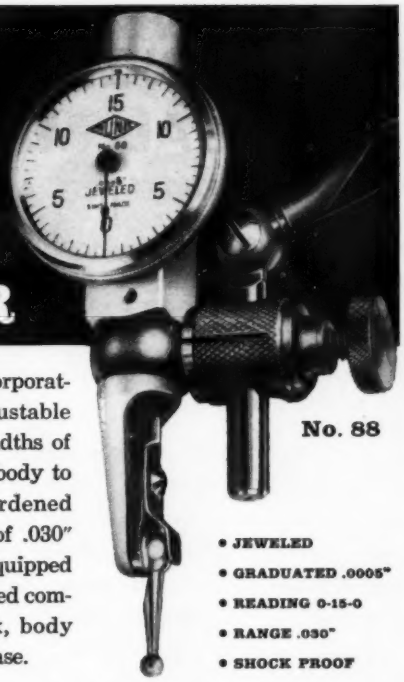
ALINA DIAL TEST INDICATOR



A fully reversible indicator incorporating a clear easy-to-read, adjustable dial, graduated in half thousandths of an inch, a switch lever on the body to reverse action and TWO hardened chrome plated contact points of .030" and .100" diameter that are equipped with a non-slip ratchet. Furnished complete with a universal shank, body clamp, and plush lined steel case.

No. 88

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ALINA WRITE FOR LITERATURE AND COMPLETE CATALOG

ALINA CORPORATION

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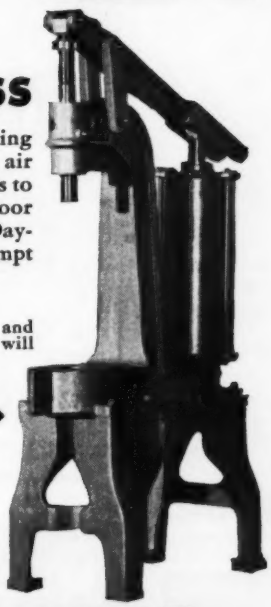

WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $570.

1-ton Hand-D-Press. For small parts manufacturers. Press only, without valves, $230.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

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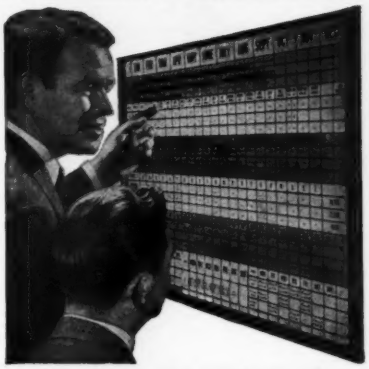

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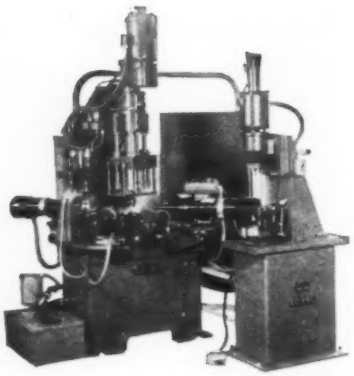

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FOR DRILLING AND TAPPING

How Govro-Nelson Automatic Drilling and Tapping Units can be used to speed up production can be seen in this two-position machine which incorporates 2 vertical and 5 horizontal units for drilling and tapping 12 holes in three similar parts.

Two holes are drilled in one position and ten holes are tapped in the second position.

The operator alternately loads the two machines, completing the drilling operations on a manually clamped fixture (right), and tapping ten holes simultaneously on the second machine (left), which automatically clamps, taps and releases the part. Output: 300 parts per hour.

If you have similar operations and would like to speed up your production rate, send samples and part prints and we shall be pleased to recommend the proper Automatic Units or quote on a complete set-up. Literature sent upon request.

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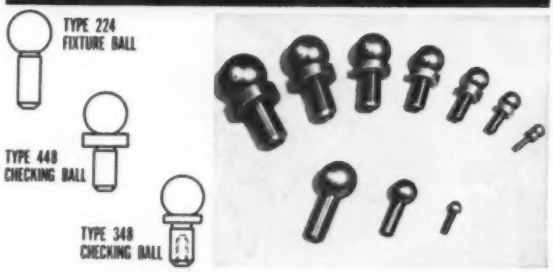
High-Precision Stainless Steel

TOOLING BALLS



- For gage, jig and tool work. Center of ball provides positive reference point for work in any plane.
- Highly accurate. Ball size held to ±.0001″ for fixture balls; ±.00002″ for checking balls.
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ANTI-FRICTION BEARINGS FOR SPECIAL REQUIREMENTS
TOOLING BALLS — MASTER BALLS — SPHERICAL FINISHING

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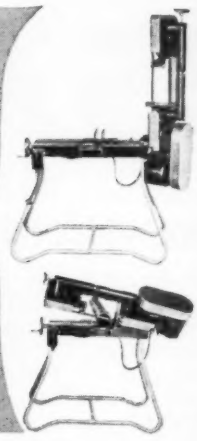
SAWS for the PRICE of

. . . use the WELLS 49A for Horizontal Cut-off and Vertical Band Sawing



The Wells 49A is a dual-purpose machine designed for shop or "job-site" work. As a horizontal cut-off saw, the 49A has a capacity of 3½″ x 6″. Swing the head to vertical position . . . it's an upright band saw. No tools required! Use it for cutting angles, slots, notches, bevels and light contour work.

The 49A can save time and money for you. Let your local Wells Distributor show you how . . . or write direct for complete information.

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Wells

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METAL CUTTING BAND SAWS

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THREE RIVERS, MICHIGAN

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3/8" and 7/16"	$ 6.75 ea.
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7/8" and 1"	$23.50 ea.
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Special sizes: 1 1/8" — 1 1/4" — 1 3/8" — 1 1/2" — 1 3/4" and 2" coarse or fine thread. Prices on request.

When ordering, specify quantity and thread size. Prices F.O.B. factory.

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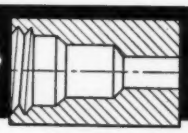

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The real impelling force at VFC, aside from developing better parts feeding equipment, is how to help industry produce more.

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COSTS SO LITTLE

SAVES SO MUCH

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★ **YOU SAVE TIME** with Speed Vise because with a half-turn and a lift of the handle the jaw is free to slide to any desired opening . . . and you have positive locking with the same speed and ease.

★ **YOU SAVE MONEY** with Speed Vise because many interchangeable Speed Vise jigs and fixtures can be made for the price of one old style type box jig.

Write today for complete information and prices.

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most **VERSATILE PIN GAGES** *made!*

Horberg exclusive taper feature lets you check undersize, oversize and odd-size holes, slots, etc., quickly and accurately with standard letter, number or drill-size gages.

A precision concentric taper on the lower half of each gage runs to 0.0012" smaller than gage size. You get a continuously accurate range of measurement with each gage, for quicker, handier, precision gaging in set-up, machining, tooling and inspection operations.

SPECIFICATIONS

Diameter accurate to +0.0001" —0.0000"
Standard 1.5" length
Concentric taper on lower half to .0012" smaller size
Oil hardened tool steel

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Sets furnished in indexed plastic case. Extra case $15.00
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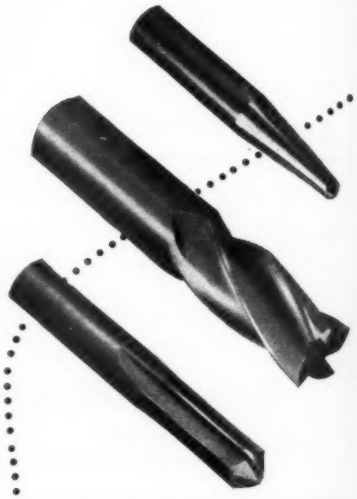

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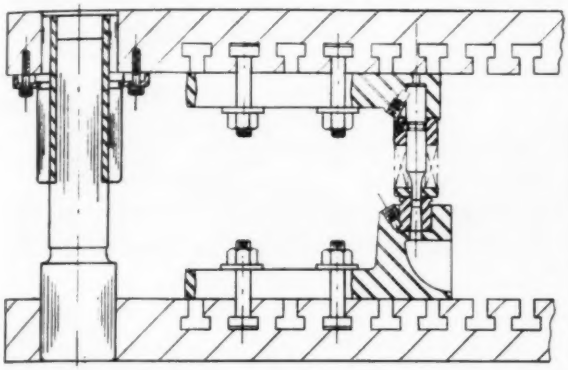
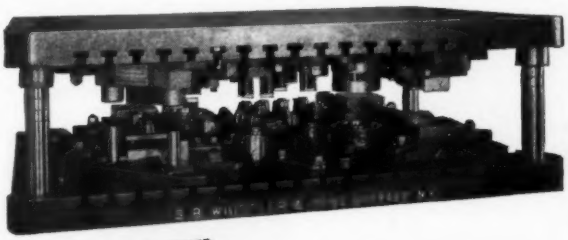
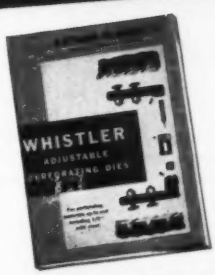


Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.





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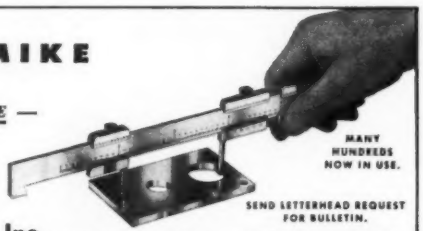

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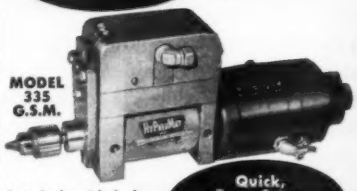

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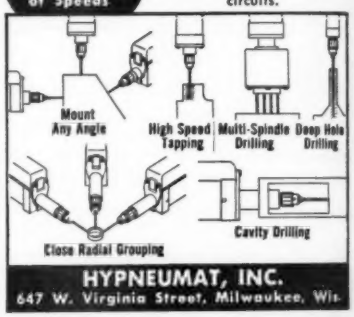

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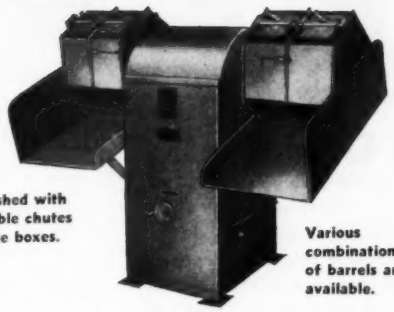

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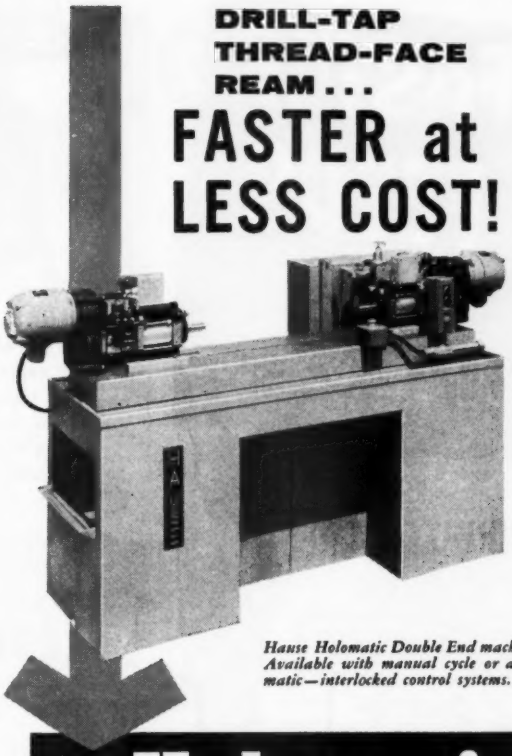

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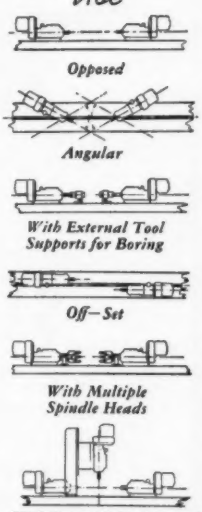

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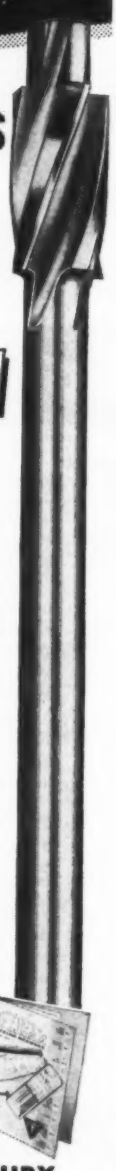

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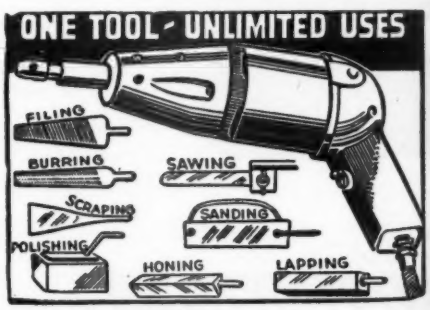

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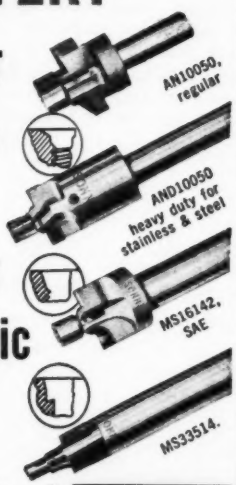

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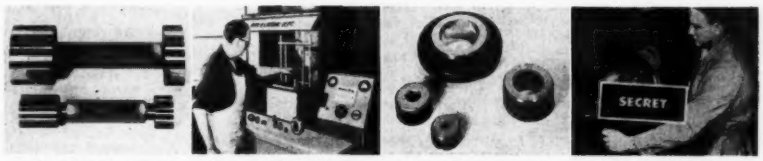

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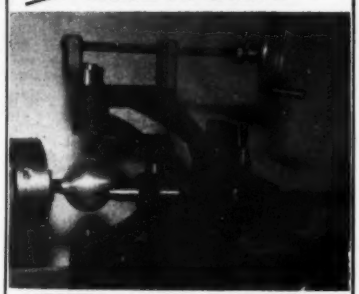

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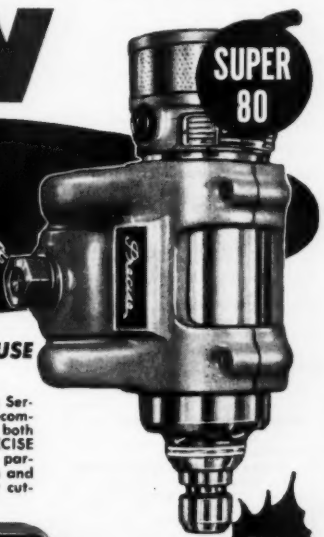

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SUBJECT INDEX

Abrasive machining
Belt grinding of motor rotors, Jan. p. 151 (½ p)
New techniques in machining methods, Jan. p. 63 (6 pp)

Adhesives
Epoxy bonding of carbides to steel, Feb. p. 79 (5 pp)

Airfoil, machine for milling, Apr. p. 92 (1½ pp)

Air power
Air-actuated clamping blocks, Apr. p. 85 (1 p)
Air gages for measuring distance between hole centers, Sept. p. 95 (9 pp)
Circuits, safe pneumatic, self teaching methods for, July, p. 80 (4 pp)
Cylinders, 10 widely held misconceptions of, Apr. p. 132 (2/3 p)
Multiple gun drilling, air feed, May, p. 105 (3 pp)
Notebook: Tips on air equipment maintenance, Feb. p. 111 (4 pp)
Vacuum locating device for precision drilling, Sept. p. 108 (½ p)

Alloys, brazing, selection of, Aug. p. 93 (5 pp)

Apprenticeship
Dividing skilled groups, Apr. p. 114 (½ p)
Program building, Jan. p. 11 (3 pp)

Assembly
Adapters, torque wrench, for hard to reach spots, July, p. 110 (2/3 p)
Automatic, machines for, Apr. p. 89 (3 pp)
Automatic, product designing for, July, p. 16 (2-1/3 pp)
Small parts, automation for, Aug. p. 71 (1 p)

Automatic handling
Basketing workpieces, Feb. p. 119 (½ p)
Demand-feed distribution system, Jan. p. 77 (1/3 p)
Heat treating, loading gears for, July, p. 133 (1/3 p)
Product designing for, July, p. 16 (2-1/3 pp)
Shuttle transfer conveyor, Jan. p. 108 (¼ p)
Stacker for tube and bar transfer, July, p. 120 (1/3 p)
Storage unit, rotary, Apr. p. 84 (½ p)
Transfer presses, on, June, p. 87 (13½ pp)

Automation
Automated control of gear quality, May, p. 91 (6 pp)
Built-in quality control, May, p. 104 (1 p)
Capital cost of, June, p. 82 (1 p)
Color coding to simplify machine changeover, June, p. 75 (2¾ pp)
Dressing grinding wheels for, July, p. 85 (2 pp)
Example of, Oct. p. 87 (2 pp)
In-process Q-C for transfer lines, May, p. 81 (5 pp)
Magnetic memory system for, Mar. p. 219 (1/3 p)
Maintenance problems of, June, p. 82 (1 p)
Myths and fallacies of, Mar. p. 95 (4 pp)
Product designing for, July, p. 16 (2-1/3 pp)
Small parts assembly, using, Aug. p. 71 (1 p)
Standard units for, June, p. 122 (½ p)
Transfer presses for, June, p. 87 (13½ pp)

Bail-broaching, for bushing assembly, Oct. p. 116 (½ p)

Bailizing, hole sizing and finishing process, Oct. p. 116 (1/3 p)

Bearings, roller, automation for, Oct. p. 87 (2 pp)

Bearingizing, internal and external sizing process, Oct. p. 114 (½ p)

Bonuses for supervisors, Feb. p. 148 (1 p)

Boring heads, multi-diameter, Feb. p. 89 (6 pp); Mar. p. 99 (6 pp)

Boring machine, multiple spindle, June, p. 104 (1 p)

Boring tool trouble analysis, Mar. p. 99 (6 pp)

Brake forming, theory of, Oct. p. 77, (8 pp)

Brazing
Air clamps for, Apr. p. 85 (1 p)
Alloy selection and joint design, Aug. p. 93 (5 pp)
Fundamentals for, May, p. 99 (5 pp)
Heating source and procedures for, Sept. p. 85 (5½ pp)
Induction, ceramic jigs for, June, p. 78 (1 p)

Broaching, external, on automatic screw machine, June, p. 73 (2 pp)

Broaching machine, automated, Jan. p. 154 (½ p)

Burnishing, Oct. p. 112 (½ p)

Burnishing, roller, internal finishing, process, Oct. p. 114 (½ p)

Cams engineered for their production in limited quantities, July, p. 92 (3 pp)

Carbide
Bonding with epoxy, Feb. p. 79 (5 pp)
Boring of multi-diameters, Feb. p. 89 (6 pp); Mar. p. 99 (6 pp)
Brazing, special fluxes for, Mar. p. 104 (¼ p)
Dies, hot heading titanium bolts with, Mar. p. 111 (1/3 p)
Dies produce quality parts, Feb. p. 58 (1 p)
Drilling and reaming of precision holes, July, p. 71 (4 pp)
Grades classified, Feb. p. 95 (4 pp)
Gun drilling, fixturing for, Mar. p. 79 (4 pp)
Machining hi-temp alloys with, Feb. p. 73 (6 pp)
Metallurgy, Feb. p. 95 (4 pp)
Milling with, Feb. p. 85 (4 pp)
Multiple gun drilling, May, p. 105 (3 pp)
Super-hard, for long tool life, Aug. p. 77 (4 pp)
Tipped soldering jigs, May, p. 148 (½ p)

Chemical milling, applications of, Aug. p. 98 (2-1/3 pp)

Ceramic tooling, discussion of, June, p. 100 (1½ pp)

Circuits, safe pneumatic, self teaching methods for, July, p. 80 (4 pp)

Coated abrasive machining methods, Jan. p. 63 (6 pp)

Cold Forming
Ball-broaching for bushing assembly, Oct. p. 116 (½ p)
Ballizing, hole sizing and finishing process, Oct. p. 116 (1/3 p)
Blanks, steel, multi-diameter, Oct. p. 150 (½ p)
Bearingizing, internal and external sizing process, Oct. p. 114 (½ p)
Burnishing, process for, Oct. p. 112 (½ p)
Burnishing, roller, internal finishing process, Oct. p. 114 (½ p)
Cold extrusion, Oct. p. 95 (2-1/5 pp)
Drawing, deep, Oct. p. 105 (2 pp)
Forging, cold, Oct. p. 101 (1¾ pp)
Form and spline rolling, Oct. p. 122 (1/3 p)
Heading, cold, Oct. p. 102 (2-¾ pp)
Impact extrusion, Oct. p. 97 (3-½ pp)
Metallurgy of, Oct. p. 93 (2-1/3 pp)
Roll-forming, shaping coiled strip, Oct. p. 120 (1/3 p)
Roll-planishing, flattening weld beads, Oct. p. 120 (1/3 p)
Rolled extrusion, Oct. p. 118 (½ p)
Shot-peening, Oct. p. 122 (1/3 p)
Special report on, Oct. p. 91 (27 pp)
Spinning, Oct. p. 118 (½ p)
Stretch-wrap forming, Oct. p. 122 (1/3 p)
Swaging, Oct. p. 107 (1-3/5 pp)
Thread rolling, Oct. p. 109 (3-½ pp)
Tube bending, Oct. p. 120 (1/3 p)
Turks head, rod shaping multi-roll for, Oct. p. 116 (1/3 p)

Cold forming process, Fellows-Appel, Mar. p. 78 (1 p)

Color coding to simplify machine changeover, June, p. 75 (2¾ pp)

Controls
Automation magnetic memory system, Mar. p. 219 (1/3) p
Electro-hydraulic servo system, Jan. p. 104 (½ p)
Electro-hydraulic transducer, Feb. p. 105 (5½ pp)
Numerical, for jig borers, etc. Apr. p. 80 (1 p)
Numerical, in aircraft industry, Feb. p. 48 (1½ pp)
Press "non-repeating" system, June, p. 108 (1/3 p)
Tape, for positioning table, Mar. p. 88 (1 p)
Tracer, for profile milling, Apr. p. 181 (¾ p)
Welding, Feb. p. 110 (¾ p)

Coolants
Abrasive machining, Jan. p. 67 (½ p)
Gun drilling, for, Mar. p. 79 (4 pp); May, p. 105 (3 pp)
Honed bores automatically sized with, Sept. p. 104 (1 p)
Inductor bushing for drilling copper, June, p. 79 (3 pp)
Synthetic, test report on, May, p. 180 (½ p)

Countersink, self-aligning, Jan. p. 94 (1/3 p)

Coupling, flexible, compensates for shaft misalignment, July, p. 106 (1 p)

Cutting tools
Bi-carbide, construction for, Aug. p. 77 (4 pp)
Ceramic, pros and cons of, June, p. 100 (1½ pp)
Form milling cutters, design and application of, Mar. p. 89 (3½ pp)
It's time to re-evaluate, July, p. 69 (1 p)
Multi-diameter, Feb. p. 89 (6 pp); Mar. p. 99 (6 pp)

Deburring of copper tubing, Jan. p. 78 (1 p)

Deep drawing of molybdenum anodes, June, p. 106 (2 pp)

Design, high production tools, of, Mar. p. 74 (4 pp)
Weldment unit, layout and erection of Oct. p. 88 (2 pp)

Designing for easier machining, automatic handling and assembly, July, p. 16 (2-1/3 pp)

Diamond pins, establishing sizes of, Aug. p. 84 (2 pp)

Diamond powder cutters for dressing grinding wheels, July, p. 85 (2 pp)

Dies
Carbide, hot heading titanium bolts with, Mar. p. 111 (1/3 p)
Carbide, produce quality parts, Feb. p. 58 (1 p)
Contour sawing of, Apr. p. 100 (1 p)
Die-casting, mould coatings for, Aug. p. 91 (2 pp)
Epoxy-faced June, p. 103 (1 p)
Large, die-layout machine for, Aug. p. 76 (1 p)
Progressive, for limited run stamping, Aug. p. 89 (2 pp)
Progressive, 9 station cut and carry, Oct. p. 73 (4 pp)
Short run, construction of, Sept. p. 81 (4 pp)
Steel rule, Oct. p. 85 (1 p)

Die Sinker, equipped for deep tracing, Feb. p. 105 (5½ pp)

Die sets for steel rule dies, Oct. p. 85 (1 p)

Drawing, deep, Oct. p. 105 (2 pp)

Drawing lubricant selection, July, p. 87 (5 pp)

Drilling
Copper, coolant inductor bushing for, June, p. 79 (3 pp)
Gun, fixturing for, Mar. p. 79 (4 pp)
Gun, multiple, air-powered, May, p. 105 (3 pp)
Machine, deep hole, Jan. p. 51 (¼ p)
Production drilling of precision holes, July, p. 71 (4 pp)
Vacuum locating device for precision drilling, Sept. p. 108 (½ p)
Variable workpieces, Jan. p. 69 (3 pp)
Wide range of bolt circle diameters, Apr. p. 109 (1/3 p)

Drill press fixture for lapping, Aug. p. 87 (1½ pp)

Drills, trepan-type, for precision holes, July, p. 71 (4 pp)

Economics, industrial
Car battle of 1958, Sept. p. 71 (1 p)
Editors look at '57, Jan. p. 61 (1 p)
Machine tool outlook for '57, Jan. p. 72 (5-2/3 pp)
Machine tool sales to hit billion dollars, Jan. p. 156 (½ p)
Obsolescence of machine tools, June, front cover, (2 pp)
Tool and die forecast for '57, Jan. p. 156 (3/5 p)

Electrolytic grinding of honeycomb, Apr. p. 185 (1/3 p)

Engineering, definition of, Oct. p. 54 (2-1/6 pp)

Experimental designs, Apr. p. 119 (5 pp)

Extruding
Cold, Oct. p. 95 (2-1/5 pp)
Impact, Oct. p. 97 (3½ pp)
Spray lubrication for, May, p. 149 (¼ p)

Feeds for transfer presses, June, p. 87 (13½ pp)

Fixtures (see Jigs and fixtures)

Forging, cold, Oct. p. 101 (1¾ pp)

Form and spline rolling, Oct. p. 122 (1/3 p)

Form milling cutters, design and application of, Mar. p. 89 (3½ pp)

Gages
Air-type, for automation quality control, May, p. 104 (1 p)
Maintenance of, May, p. 80 (½ p)

Gaging
Air, for measuring distance between hole centers, Sept. p. 95 (9 pp)
Air, of drill jig bushings, Apr. p. 81 (3½ pp)
Automatic, for gear dimensional accuracy, May, p. 91 (6 pp)
Electronic system for grinders, Apr. p. 174 (1/3 p)
Fixture for gaging OD of segment-shaped components, Sept. p. 91 (2½ pp)
In-process quality control equipment, May, p. 81 (5 pp)
Stampings, details of, Aug. p. 73 (3 pp)

Gears, automated control of quality production, May, p. 91 (6 pp)

Grinding and finishing
Abrasive machining methods, Jan. p. 63 (6 pp)
Belt grinding of motor rotors, Jan. p. 151 (½ p)
Cylindrical machine for large light work, Jan. p. 147 (1/3 p)
Dressing grinding wheels automatically, July, p. 85 (2 pp)
Electrolytic, of honeycomb, Apr. p. 185 (1/3 p)
Fixturing for rotary surface grinder, Apr. p. 73 (5 pp)
Grinder for heavy stock removal, June, p. 86 (1 p)
Grinding crankpins automatically, Sept. p. 90 (½ p)
Numerically controlled hole grinder, Apr. p. 80 (1 p)
Precision, of servo valve components, Apr. p. 88 (1 p)
Surface grinder for large dies, July, p. 117 (1 p)
Tool post grinders, versatility of, July, p. 84 (1 p)

Grinding, tool
Form milling cutters, Mar. p. 89 (3½ pp)

Gun drilling
Fixturing for, Mar. p. 79 (4 pp)
Multiple, air-powered, May, p. 105 (3 pp)

Heading, cold, Oct. p. 102 (2¾ pp)

Heat treating
Automatically loading gears for, July, p. 133 (1/3 p)
Critical quenching speed, Mar. p. 74 (4 pp)
Rapid quenching with reduced distortion, Jan. p. 78 (3½ pp)
Stainless steel for honeycomb structures, Sept. p. 73 (8 pp)

Honing, bores automatically sized by, Sept. p. 104 (1 p)

Hydraulics
Cylinders, 10 widely held misconceptions of, Apr. p. 132 (2/3 p)

Inspection
Distance between hole centers, measurement of, Sept. p. 95 (9 pp)
100%, on small motors, May, p. 87 (3½ pp)
Tools, of, May, p. 18 (1½ pp)

Interferometer-digital counter measuring system, Mar. p. 83 (4½ pp)

Inventory
In-process, shrinkage of, May, p. 116 (1½ pp)
Management principles, Jan. p. 83 (4 pp; 12 pp in Nov. and Dec. '56 issues)

Jigs and fixtures
Boring and turning, work holding rules for, July, p. 75 (4 pp)
Drill jig centers variable workpieces, Jan. p. 69 (3 pp)
Fixtures, air, for silver brazing,
Fixtures for band saw cutting, Sept. p. 122 (2 pp)
Apr. p. 85 (1 p)
Fixture for drill press lapping, Aug. p. 87 (1½ pp)
Fixture for gaging OD of segment-shaped components, Sept. p. 91 (2½ pp)
Fixtures for gun drilling, Mar. p. 79 (4 pp)
Fixtures for surface grinding, Apr. p. 73 (5 pp)
Jigs, ceramic, aid to brazing, June, p. 78 (1 p)
Plastic, for short runs, Feb. p. 182 (¾ p)
Tool steels for high production, Mar. p. 74 (4 pp)

Lathe
Automatic or turret, hydraulic tracing unit for, Oct. p. 90 (1 p)
Center drive, tracing, for contouring, Aug. p. 86 (1½ pp)
Turret, tooling for valve parts, Apr. p. 86 (2 pp)
Vertical chucking, May, p. 252 (1 p)

Lubricant
Castor oil, for deep drawing molybdenum, June, p. 106 (2 pp)
Drawing, selection for, July, p. 87 (5 pp)
Fire-safe for air compressors, Sept. p. 134 (½ p)
Spray, for extruding, May, p. 149 (¼ p)

Machine tool industry
Machine tool sales to hit billion, Jan. p. 156 (½ p)
Obsolescence, June, front cover (2 pp)
Outlook for '57 by industry leaders, Jan. p. 72 (5-2/3 pp)

Machining (also see specific process)
Abrasive, belt grinding of motor rotors, Jan. p. 151 (½ p)
Abrasive, new techniques in machining methods, Jan. p. 63 (6 pp)
Chemical milling process for, Aug. p. 98 (2-1/3 pp)
Contouring jet discs, Aug. p. 86 (1½ pp)
Contour sawing large workpieces, Apr. p. 100 (1 p)
Cost cutting with band saw, Sept. p. 122 (2 pp)
High temperature alloys with carbides, Feb. p. 73 (6 pp)
Hydraulic valves, machining and testing of, Apr. p. 101 (4 pp)
Motor load measurement detects trouble, Sept. p. 94 (1 p)
Product designing for, July, p. 16 (2-1/3 pp)
Profile milling jet engine blades, Sept. p. 118 (2/3 p)
Profiling, numerically controlled, Feb. p. 48 (1½ pp)
Spark erosion process, May, p. 164 (½ p)
Titanium, a case history of, June, p. 83 (3 pp)
Tracing without templates, Feb. p. 105 (5½ pp)
Turning and boring, work holding rules for, July, p. 75 (4 pp)

Maintenance
Automation, problems of, June, p. 82 (1 p)
Gages, May, p. 80 (½ p)
Machine parts, protection of, Oct. p. 126 (2 pp)
Management for small plants, Apr. p. 9 (2¼ pp)
Preventive, Feb. p. 120 (1-1/3 pp)

Management
Bonuses for supervisors, Feb. p. 148 (1 p)
Industry-education programs, organizing for, Sept. p. 57 (2-2/3 pp)
Mathematical programming for, Apr. p. 94 (6 pp)
Overtime costs, questions and answers for, Sept. p. 112 2 pp)
Preventive maintenance records, Feb. p. 120 (1-1/3 pp)
Quality assurance and reliability, Mar. p. 12 (2¼ pp)
Role and responsibility in safety programs, Apr. p. 110 (2/3 p)
Safety economics in stamping plants, June, p. 114 (2¼ pp)
Scheduling engineers' activities, Feb. p. 173 (½ p)
The million-dollar lathe, May, p. 77 (1 p)
Time study of punch-press operations, Feb. p. 99 (6 pp)
Training for quality control, May. p. 97 (2¼ pp)

Manpower shortage, 20 ways to ease, Apr. p. 78 (2 pp)

Mathematical programming, a short cut to, Apr. p. 94 (6 pp)

Measurement methods
Distance between hole centers, measurement of, Sept. p. 95 (9 pp)
Fringecount micrometer, Mar. p. 83 (4½ pp)

Metallurgy of cold forming, Oct. p. 93 (2-1/3 pp)

Methods-time measurement, Feb. p. 99 (6 pp)

Milling
Cutters, form, design and application of, Mar. p. 89 (3½ pp)
Head, hydraulic, Feb. p. 116 (1 p)
Profile, tracer controlled, Apr. p. 181 (¾ p)
Shaping giant airfoils and complex parts, Apr. p. 92 (1½ pp)
With carbides, Feb. p. 85 (4 pp)

Molybdenum anodes, deep drawing of, June, p. 106 (2 pp)

Mould coatings, function and selection of, Aug. p. 91 (2 pp)

Obsolescence of machine tools, June, front cover (2 pp)

Optical measuring system, Mar. p. 83 (4½ pp)

Patent Suits, Mar. p. 110 (1 p)

Personnel management
Bonuses for supervisors, Feb. p. 148 (1 p)
Departmental loan of workers, Aug. p. 81 (3 pp)
Foreman selection, Mar. p. 57 (1 p); Apr. p. 148 (1-1/3 pp); May, p. 58 (1 p)
Foreman selection, evaluation contamination in, June, p. 57 (1 p); July, p. 48 (1-1/3 pp)
Foreman selection, minimizing evaluation deficiencies for, Sept. p. 15 (1-1/3 pp)
Hiring new employees, Feb. p. 14 (1 p)
Moonlighting, Oct. p. 71 (1 p)
Performance evaluation and foreman selection, May, p. 58 (1 p)
Selection testing, Jan. p. 46 (2/3 p)
Supervisor selection, evaluation for, Aug. p. 52 (1-1/3 pp)

Pins, diamond, establishing sizes of, Aug. p. 84 (2 pp)

Plastic tooling
Epoxy-faced die, June, p. 103 (1 p)
Short run operations, Feb. p. 182 (¾ p)

Pneumatic (see Air Power)

Press Brakes, forming forces in, Oct. p. 77 (8 pp)

Presses
Automatic for limited run stamping, Aug. p. 89 (2 pp)
Die change pushbutton controlled, Aug. p. 107 (½ p)
Dieing machine, Oct. p. 73 (4 pp)
Function of lubricant in press drawing, July, p. 87 (5 pp)
"Non-repeating" safety system, Jan. p. 108 (1/3 p)
Pre-set dies for short run production, Aug. p. 114 (½ p)
Productivity, true measurement of, May, p. 116 (1½ pp)
Punch, time study of operations, Feb. p. 99 (6 pp)
Transfer, for automation, June, p. 87 (13½ pp)

Preventive maintenance, usable records, Feb. p. 120 (1-1/3 pp)

Production and inventory control society formed (APICS), Apr. p. 113 (1/3 p)

Production data automatically recorded, Mar. p. 93 (1¾ pp)

Profile sharpening of milling cutters, Mar. p. 89 (3½ pp)

Quality Control
Assurance and reliability, Mar. p. 12 (2¼ pp)
Automated gear production with, May, p. 91 (6 pp)
Built into automation lines, May, p. 104 (1 p)
Control of surface quality and geometry, May, p. 108 (4 pp)
Peg-board Q-C, May, p. 78 (2½ pp)
Prove it, May, p. 114 (½ p)
Reliability, evolution of, Mar. p. 73 (1 p)
Semi and final assembling small motors by, May, p. 87 (3½ pp)
Tool proofing: a means of, May, p. 18 (1½ pp)
Training for, May, p. 97 (2¼ pp)
Transfer-type special machine tools with, May, p. 81 (5 pp)
TV system assists spotwelding control, Sept. p. 120 (½ p)
Zero center method of, May, p. 78 (2½ pp)

Quenching with reduced distortion, Jan. p. 78 (3½ pp)

Reamers, trepan-type, for precision holes, July, p. 71 (4 pp)

Recorder, automatic, of production data, Mar. p. 93 (1¾ pp)

Rolled extrusion, Oct. p. 118 (½ p)

Roll-forming, shaping coiled strip, Oct. p. 120 (1/3 p)

Roll-planishing, flattening weld beads, Oct. p. 120 (1/3 p)

Safety
Does not cost money: it pays money, June, p. 114 (2¼ pp)
Holding employee interest in, Jan. p. 140 (1¼ pp)
Investigating and reporting of industrial accidents, June, p. 102 (2/3 p)
Job safety, analysis of, Aug. p. 100 (2/3 p)
Programs, management's role and responsibility in, Apr. p. 110 (2/3 p)
Safer plants, a plan for, Oct. p. 124 (2/3 p)

Scrap disposal, automatic, Jan. p. 149 (½ p)

Screw-machine
Automatic, external broaching on, June, p. 73 (2 pp)
High speed, holds limits to 0.0005", Apr. p. 93 (1 p)
Plunge thread rolling on, May, p. 86 (1 p)

Shot peening, Oct. p. 122 (1/3 p)

Small plants, maintenance management of, Apr. p. 9 (2¼ pp)

Soldering, automatically, of fuel-tank filler necks, Aug. p. 106 (1½ pp)

Special machines (also see "Automation")
Automatic, for soldering, Aug. p. 106 (1½ pp)
Automatic, from standard units, Apr. p. 89 (3 pp)
Profile milling jet engine blades, Sept. p. 118 (2/3 p)

Spinning, Oct. p. 118 (½ p)

Stampings
Gaging of, Aug. p. 73 (3 pp)
Limited run, press and die for, Aug. p. 89 (2 pp)

Standard units for
Automatic machines, June, p. 122 (½ p)
Automatic special machines, Apr. p. 89 (3 pp)
Versatile boring machine, June, p. 104 (1 p)

Steel
Stainless, for honeycomb structures, Sept. p. 73 (8 pp)
Standards, guide to specifying, Feb. p. 126 (1-2/3 pp)
Tool, proper selection of, Mar. p. 74 (4 pp)

Stretch-wrap forming, Oct. p. 122 (1/3 p)

Surface quality and geometry, laboratory control of, May, p. 108 (4 pp)

Swaging, Oct. p. 107 (1-3/5 pp)

Tape, for positioning table, Mar. p. 88 (1 p)

Thread rolling, Oct. p. 109 (3½ pp)

Titanium, production machining of, June, p. 83 (3 pp)

Tool design and fabrication, Mar. p. 74 (4 pp)

Tools, inspection of, May, p. 18 (1½ pp)

Training, for quality control, May, p. 97 (2¼ pp)

Transfer machine handles 36 different parts, June, p. 75 (2¾ pp)

Transfer presses for automation, June, p. 87 (13½ pp)

Tube bending, Oct. p. 120 (1/3 p)

Tubing, deburring of copper, Jan. p. 78 (1 p)

Turks head, multi-roll rod shaper, Oct. p. 116 (1/3 p)

TV for die-layout machine, Aug. p. 76 (1 p)

Welding
Automatic arc, Jan. p. 82 (½ p)
Controls, Feb. p. 110 (¾ p)
Layout and erection unit for, Oct. p. 88 (2 pp)
Machine automated for welding, assembling, machining, testing, July, p. 128 (1/3 p)
Spatter problem solved, Feb. p. 118 (1 p)
Spot, TV system assists control of, Sept. p. 120 (½ p)

Wheel dressing process, grinding, July, p. 85 (2 pp)

Work holding rules for turning and boring, July, p. 75 (4 pp)

ADVERTISERS' INDEX

Aber Engrg. Works, Inc. 198
Acme Tool Co. 216
Acme Danneman Co., Inc. 136
Acro Metal Stamping Co. 175
Advance Products 154
Aget Mfg. Co. 178
Air-Mite Devices, Inc. 190
Alina Corp. 209
Allegheny Ludlum Steel Corp. 167
Allen Mfg. Co. 5
Allied Products Corp., Richard Brothers Punch Div. 121
Allison Div., American Chain & Cable Co. 196
American Chain & Cable Co., Allison Div. 196
Wilson Mechanical Instrument Div. 183
American Positive Grip Vise Corp. 170
Ampco Metal, Inc. 112
Armstrong Bros. Tool Co. 206
Atlas Press Co., Clausing Division 143
Automation Devices, Inc. 211
Avildsen Tools & Machines, Inc. 173

Baird Machine Co., Inc. 18
Balas Collet Mfg. Co. 224
Barnes Co., Inc., W. O. 142
Bausch & Lomb Optical Co. 116
Bellows Co., The 17
Benchmaster Mfg. Co. 104
Black Drill Co., Inc. 150
Blake Co., Inc., Edward 201
Bliss Co., E. W. 125, 207
Bodine Corp., The 103
Brown & Sharpe Mfg. Co. 59
Bryant Chucking Grinder Co. 159, 207
Buck Tool Co. 195
Buckeye Tools Corp. 64
Bushman Co., H. L. 222
Business Publications Audit of Circulation, Inc. 146

Cadillac Gage Co. 105
Cardinal Machine Co. 212
Carpenter Steel Co., The 109
Challenge Machinery Co., The 130
Chandler Tool Co. 202
Chicago Screw Co. 115
Chicago Tool & Engineering Co. 190
Cincinnati Milling Machine Co., The 101
Clausing Div., Atlas Press Co. 143
Cleveland Twist Drill Co. 111
Cogsdill Tool Products 161
Comet Tool Co. 211
Composite Forgings, Inc. 190
Comtor Co. 155
Cone Automatic Machine Co. 53
Conical Tool Co., ...221
Continental Tool Works, Div. Ex-Cell-O Corp. 151
Cook, Inc., Lawrence H. 189
Cooper Weymouth, Inc. 197
Cosa Corp. 180
Covel Mfg. Co. 23
Crucible Steel Co. of America 58
Cullen Mfg. Co. 201

Dayton Rogers Mfg. Co. 150, 174, 190
Dearborn Gage Co. 50
Detroit Power Screwdriver 147
Detroit Stamping Co. 181, 204
DeVlieg Machine Co. 140
Dice Co., J. W. 160
Dickerman Mfg. Co., H. E. 157
DoAll Co., The 127
Donley's Sons, Inc., Ernest F. 182
Dow Chemical Co., The 19
Drillmation Co. 152
Dumore Co., The 129, 131
Durable Punch & Die Co. 158
Durant Tool Supply Co. 193
Dykem Co., The 170

Eastern Machine Screw Corp., The 182
Eastman Kodak Co. 21
Eclipse Counterbore Co. 159
Economy Tool & Machine Co. 186
Eisler Engineering Co., Inc. 214
Elox Corp. of Michigan 63
Enco Mfg. Co. 222
Engis Equipment Co. 159
Enterprise Machine Parts Co. 207
Erickson Tool Co. 66
Ex-Cell-O Corp., Continental Tool Works Div. 151

Falcon Tool Co. 41
Felters Co., The 202
Fenn Mfg. Co. 56
Ford Mfg. Co., Inc., M. A. 212
Frick-Gallagher Mfg. Co., The 138
Froom & Co., R. H. 211

Gaertner Scientific Corp., The 201
Gage Co. 163
Gallmeyer & Livingston Co. 165
Genessee Mfg. Co. 178
Glover Mfg. Co. 193
Gorton Machine Co., George 40

ADVERTISING REPRESENTATIVES

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Govro-Nelson Co. 210
Graphic Systems 209
Griest Mfg. Co., The 191
Gridley Machine Div., New Britain Machine Co. 34

Hamilton Tool Co., The 42, 203, 205
Hammond Machinery Builders, Inc. 7
Hanchett Magna-Lock Corp. 108
Hannifin Corp. 209
Hardinge Brothers, Inc. 16
Harig Mfg. Corp. 15
Hause Engineering 215
Heimann Mfg. Co. 204
Heuser Mfg. Co. 174
Hevi Duty Electric Co. 187
Hill Acme Co. 24, 163
Hi-Shear Rivet Tool Co., The 174
Horberg Gage Co., The 212
Hovis Screwlock Co. 188
Huebner Publications, Inc. 110, 198, 214
Humm Safety Equipment Co. 222
Hutchinson Co., William T. 181
Hypneumat, Inc. 214

Ideal Industries, Inc. 181
Index Machine Co. 176
Industrial Tectonics, Inc. 210
Ingersoll-Rand Co. 106, 107

Jaco Devices, Inc. 201, 214, 217
Jacobs Mfg. Co. 135
Jarvis Corp. 54
Jergens Tool Specialty Co. 185
Johnson & Bassett, Inc. 193
Johnson Mfg. Corp. 179
Jones & Lamson Machine Co. 102

Kaufman Mfg. Co. 197
Kenco Mfg. Co. 160
Kidde Precision Tool Corp. 152, 222

L-W Chuck Co. 197
Lapeer Mfg. Co. 194
Lavallee & Ide, Inc. 4
Lee Co., K. O. 189
Lepel High Frequency Labs, Inc. 33
Lincoln Gage Co. 208
Littell Machine Co., F. J. 45
Lodding, Inc. 192
Logan Engineering Co. 155
Logansport Machine Co., Inc. 156
Lucas-Milhaupt Engrg. Co. 215

M&S Equipment Co., Inc. 194
Machine Products Corp. 20
May-Fran Engineering, Inc. 48
Mayline Co. 130
McCrosky Tool Corp. 171
Mead Specialties Co. 194
Medelton Co., Inc. 222
Melin Tool Co., Inc. 199
Metal Carbides Corp. 177
Metallurgical Products Dept. of General Electric 38
Meyers Co., Inc., W. 189
Micromatic Hone Corp. 144, 145
Micrometrical Mfg. Co. 52
Micro-Plane, Inc. 189
Monarch Machine Tool Co., The 28
Moore Special Tool Co., Inc. 65, 198
Morris Co., The Robert E. 122

National Acme Co., The 49
Nelco Tool Co., Inc. 124
New Britain Machine Co., Gridley Machine Div. 34
Nichols-Morris Corp. 193
Nobur Mfg. Co. 207
Northwestern Tool & Engrg. Co. 39
Norton Co. 148

Ohio Knife Co., The 55
O'Neil-Irwin Mfg. Co. 22

Peaslee Metal Products Co. 214
Penn Engrg. & Mfg. Corp. 170
Perkins Machine & Gear Co. 173
Pioneer Engrg. & Mfg. Co. 62
Portage Double-Quick Tool Co. 126
Porter Precision Products 162
Potter & Johnston Co. 119
Pratt & Whitney Co., Inc. 9, 10, 11, 13
Precise Products Corp. 217
Precision-Detroit Co. 117
Precision Tool Mfg. Co. of Ill. 186
Producto Machine Co. 123, 182, 193
Putnam Tool Co. 3

Rampe Mfg. Co. 215
Reid Tool Supply Co. 156
Renaud Plastics, Inc. 6
Retco Mfg. & Sales Co. 217
Rice Pump & Machine Co. 159

Richard Brothers Punch., Allied Products Cop. 121
Richards Co., J. A. 181
Rite-O-Tool & Gage Co. 217
Robbins Co., Omer E. 184
Rockwell Mfg. Co., Delta Power Tool Div. 113
Ross Operating Valve Co. 68

Sales Service Machine Tool 200
Scherr Co., Inc., George 197, 201
Schmidt, Inc., Geo. T. 204
Scully-Jones & Co. 60
Sealol Corp. 185
Service Machine Co. 216
Shell Chemical Corp. 51
Shore Instrument & Mfg. Co., Inc. 152
Silber Products, Inc. 189
Small Lot Stamping Co. 160
Sonnet Tool & Mfg. Co. 217
Sopko & Sons Co., Wm. 177
Sorensen Center-Mikes, Inc. 214
South Bend Lathe Works 185
Spellman Co., R. L. 204
Sperry Products, Inc. 213
Spiral Step Tool Co. 177
Sping Specialty Co. 221
Standard Parts Co. 166
Standard Pressed Steel Co. 30
Standard Tool & Mfg. Co. 173
Stebar Co. 221
Steel City Testing Machines, Inc. 186
Stupakoff Div. of The Carborundum Co. 114
Superior Pneumatic & Mfg., Inc. 202
Superior Steel Products Corp. 43
Sutton Tool Co. 2
Syntron Co. 128

Taft-Peirce Mfg. Co., The 172
Tannewitz Works, The 150
Techni-Tool Products, Inc. 213
Teeter, C. B. 170
Thompson & Son Co., The Henry G. 26
Thriftmaster Products Corp. 178
Tomco Products Co. 209
Turchan Follower Machine Co. 137
Twentieth Century Mfg. Co. 216

Uddeholm Co. of America, Inc. 14
United States Diamond Wheel Co. 189
Unitron Instrument Div. of United Scientific Co. 202
Universal Engineering Co. 47

Valenite Metals Corp. 164
Vapor Blast Mfg. Co. 61
Vernon Devices, Inc. 189
Verson Allsteel Press Co. 223
Vlier Engineering, Inc. 25
Vulcan Tool Co. 132, 163

Wales-Strippit Corp. 46
Walls Sales Corp. 182
Walton Co., The 204
Ward Machinery Co. 178
Wardwell Mfg. Co., The 216
Warner & Swasey Co. 139
Watts Brothers Tool Works 182
Watts Regulator Co. 120
Weldon Tool Co. 130
Wells Mfg. Corp. 210
Wesson Co. 133
West Point Mfg. Co. 57
Whistler & Sons, Inc., S. B. 213
Wilson Mechanical Instrument Div. American Chain & Cable Co. 183
Wittek Mfg. Co. 160
Woodworth, N. A. 152
Wright Tool Co. 155

Yoder Co., The 32
Yost Mfg. Co. 174

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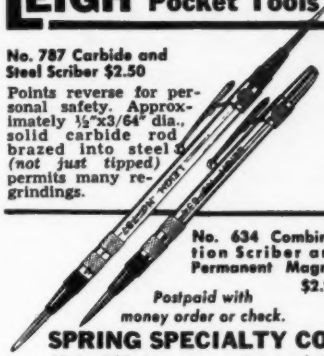

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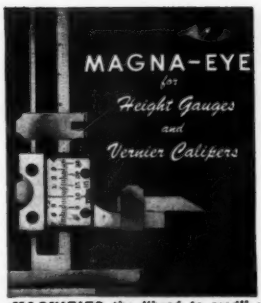

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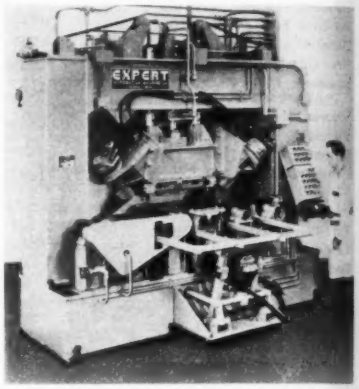

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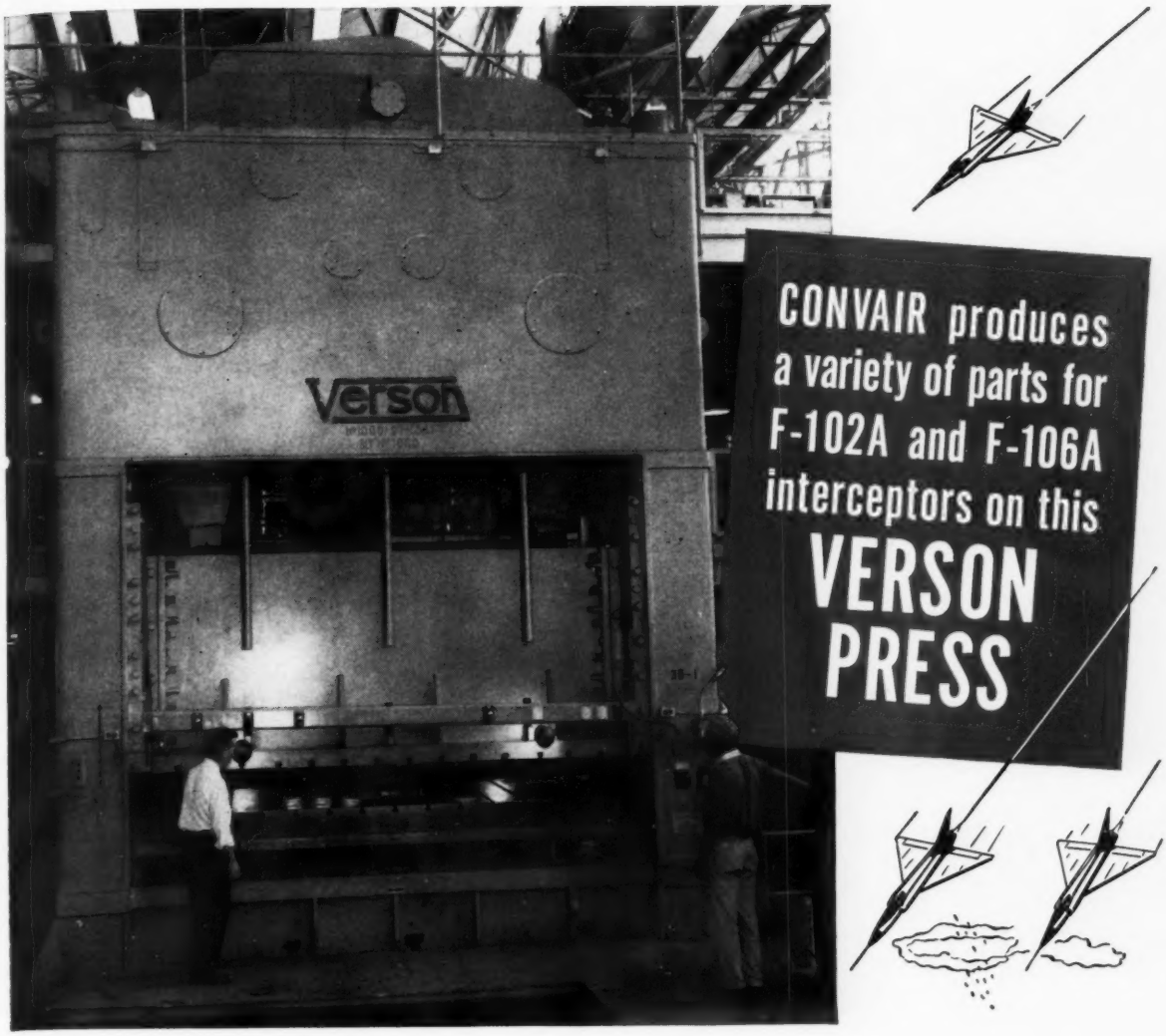

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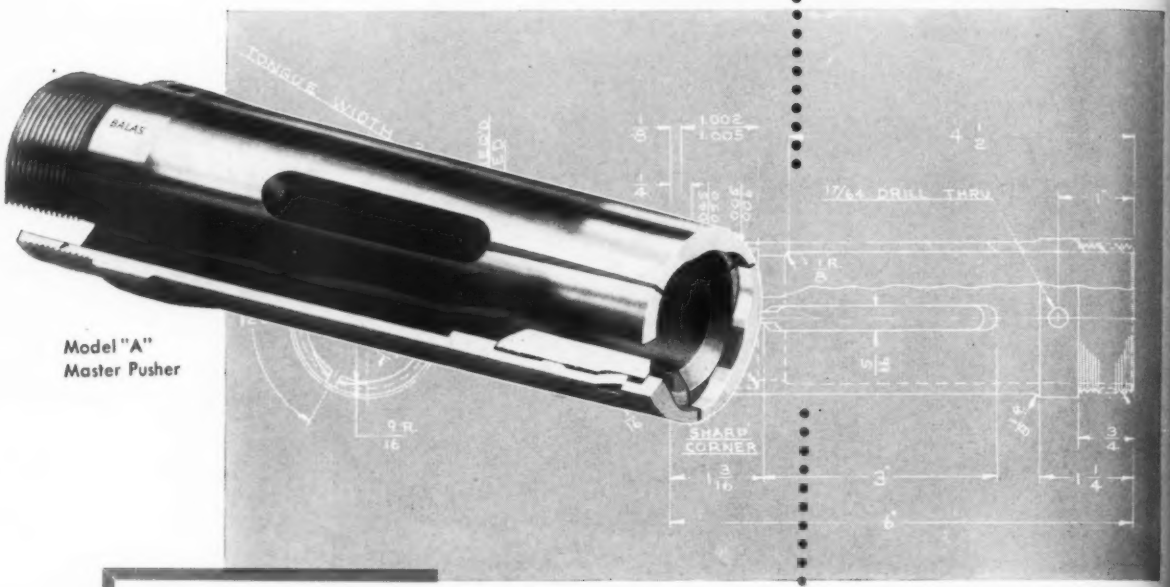

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